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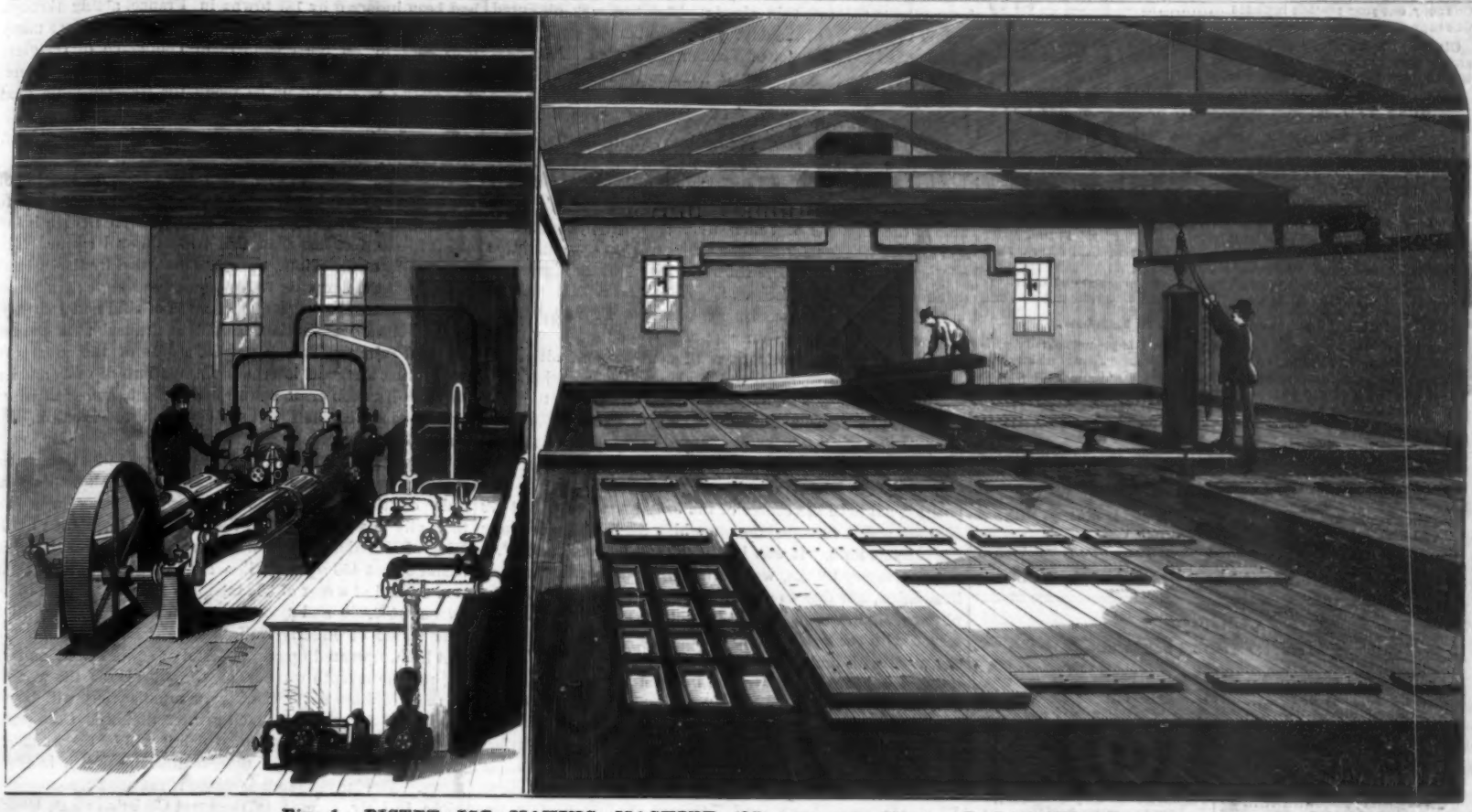

Fig. 1.—PICTET ICE MAKING MACHINE (25 tons per diem) AT LOUISVILLE KY.

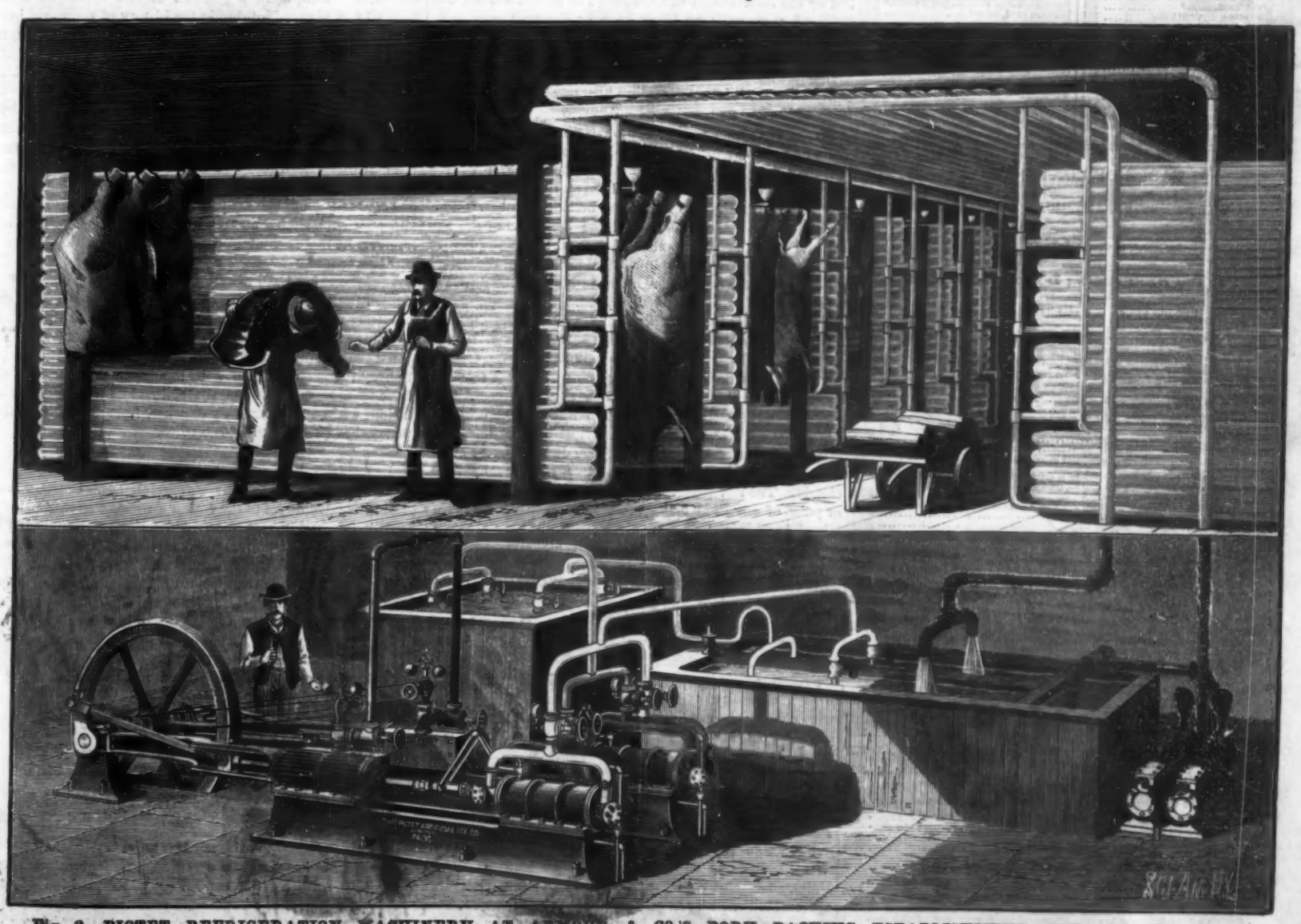

Fig. 2.—PICTET REFRIGERATION MACHINERY AT ARMOUR & CO.'S PORK PACKING ESTABLISHMENT CHICAGO.—[See page 386.]

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NEW YORK, SATURDAY, DECEMBER 16, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

A California tree	391	Letter file, improved*	393
Agricultural inventions	394	Making glass, improvements in	390
Animals, care of offspring*	392	Melting furn., drying chamber*	387
Animal tag, novel*	393	Metal Cæsium	391
Beetle, harlequin, of Cayenne*	391	Mother-of-pearl	387
Bisulph. carbon lenses	395	Novel road vehicle*	387
Car coupling, improved*	393	Oil bath	391
Carbonic acid, antiseptic props	392	Oysters, digestibility of	388
Care of offspring in animals*	392	Patents, practicability of	389
Cooling breweries, refrigeration*	386	Pictet ice machine*	383
Cotton centennial, proposed	384	Pillow-sham holder*	393
Curious nesting places	389	Plantation saw mill*	390
Digestibility of oysters	388	Railway enterprise, field for	385
Drainage and typhoid in Paris	389	Recent finds in sandstone	380
Electric boat, first*	388	Refrigeration mach., pork pack.*	383
Engineering inventions	394	Ribbon reel, new*	393
Great lake in Africa, another	396	Saw mill, improved*	390
Great statue of Liberty, the	384	Statue of Liberty, the great	384
Harlequin beetle, Cayenne*	391	Seagrave, the transit of Venus at	385
Hods, construction, use	388	Stinging trees of Australia	389
Horseshoe, novel*	393	Swiss watch trade, the	396
Human footprints in rocks	394	Tempering steel	385
Hydrogen peroxide	388	Venus, the transit of	384
Ice making, Pictet process*	396	Voltaic arc, the	393
Invention a means of edutation	385	Watch hands, improvements in*	390
Inventions, mechanical	394	Watch trade, the Swiss	396
Jacobi's electric boat, engine*	388	Woodcock carrying her young*	392

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 368,

For the Week ending December 16, 1882.

Price 10 cents. For sale by all newsdealers

PAGE

I. ENGINEERING AND MECHANICS.—The New York Canals.—Their history, dimensions, and commercial influence 5784
Cottrau's Locomotive for Ascending Steep Grades.—1 figure 5785
Bachmann's Steam Drier.—5 figures 5785
H. S. Parmelee's Patent Automatic Sprinkler.—2 figures 5785
Instrument for Drawing Converging Straight Lines.—10 figures 5786
Feed Water Heater and Purifier. By GEO. S. STRONG.—2 figures 5787
Paper Making "Down East" 5789
Goulier's Tube Gauge.—1 figure.—Plan and longitudinal and transverse sections 5790
Soldering Without an Iron 5791
Working Copper Ores at Spenceville 5791

II. TECHNOLOGY AND CHEMISTRY.—New Method of Detecting Dyes on Yarns and Tissues. By JULES JOFFRE.—Reagents.—Red colors.—Violet colors 5793
Chevalet's Condenso-purifier for Gas.—2 figures.—Elevation and plan 5794
Artificial Ivory 5794
Creosote Impurities. By Prof P. W. BEDFORD 5794

III. ELECTRICITY, ETC.—Sir William Thomson's Pile.—2 figures 5791
Siemens' Telemeter.—1 figure.—Siemens' electric telemeter 5791
Physics Without Apparatus.—Experiment in static electricity.—1 figure 5792
The Cascade Battery. By F. HIGGINS.—1 figure 5792
Perfectly Lovely Philosophy 5792

IV. ASTRONOMY, ETC.—The Comet as seen from the Pyramids near Cairo, Egypt.—1 figure 5788
Sunlight and Skylight at High Altitudes.—Influence of the atmosphere upon the solar spectrum.—Observations of Capt. Abney and Professor Langley.—2 figures 5795
How to Establish a True Meridian 5796

V. MINERALOGY.—The Mineralogical Localities in and Around New York City, and the Minerals Occurring Therein. By NELSON H. DARTON. Part III.—Hoboken minerals.—Magnesite.—Dolomite.—Brucite.—Aragonite.—Serpentine.—Chromic iron.—Dathollite.—Pectolite.—Feldspar.—Copper mines, Arlington, N.J.—Green malachite.—Red oxide of copper.—Copper glance.—Erubescite. ... 5796

VI. ENTOMOLOGY.—The Buckeye Leaf Stem Borer 5797
Defoliation of Oak Trees by *Dryocampa senatoria* in Perry County, Pa 5797
Efficacy of Chalcid Egg Parasites 5798
On the Biology of *Goniatopis Pilosus*. Thoms 5798
Species of Otiorhynchidæ Injurious to Cultivated Plants 5798

VII. ART, ARCHITECTURE, ETC.—Monteverde's Statue of Architecture.—Full page illustration, *La Architectura*. By JULI MONTEVERDE 5788
Design for a Gardener's Cottage.—1 figure 5789

VIII. HYGIENE AND MEDICINE.—Remedy for Sick Headache 5795

IX. ORNITHOLOGY.—Sparrows in the United States.—Effects of acclimation, etc 5798

X. MISCELLANEOUS.—James Prescott Joule, with Portrait.—A sketch of the life and investigations of the discoverer of the mechanical equivalent of heat. By J. T. BOTTOMLEY 5783
The Proposed Dutch International Colonial and General Export Exhibition.—1 figure.—Plan of the Amsterdam Exhibition 5796

THE TRANSIT OF VENUS.

The sky was overcast throughout a great part of the United States on the morning of December 6; and, as a rule, the atmospheric conditions during the time of the transit were not favorable for continuous and exact observation. Yet there were but few places at which no observations of value were possible, while at most of the stations enough was accomplished to make the watching astronomers fairly well pleased with the results of their day's work.

In this city the observations were fairly good after the first contact, which was missed, until toward the end of the transit, when the sky became overcast again.

At the Naval Observatory, Washington, all four contacts were observed with the twenty-six equatorial, the first and last contacts through thin clouds. The sun was obscured during the middle of the day, yet a number of good measurements of the diameter of Venus were secured. No black drop or other extraordinary phenomenon was observed, except by Superintendent Sampson at the last contact. Some fifty photographs were secured.

At Princeton, Professor Young observed all four contacts, partly through thin clouds, but on the whole satisfactorily, and took one hundred and eighty-eight photographs, mostly excellent; some were affected by clouds. Complete measures of the diameter of Venus were obtained by both filar and double image micrometers. Spectroscopic examination of the planet's atmosphere showed lines of water vapor conspicuous, and some unknown lines.

At the Allegheny Observatory, Pittsburg, Professor Langley's observations were only partially successful. Clouds prevented exact determinations of contacts and all photometric and spectroscopical work. He noticed a curious and novel phenomenon as the planet was entering upon the solar disk. When Venus had about one half entered on the sun's face, a tolerably bright point of light was seen near the circumference of the dark body of the planet outside the sun, and where no direct ray of sunlight could reach it. The position angle of the center of the bright spot was about 172 degrees, and it extended for something like 30 degrees along the planet's limb. It was luminous and distinct, and, Professor Langley thinks, was certainly not a phenomenon of irradiation, nor due to any instrumental cause, but what its physical signification is he could not conjecture. It was observed with the great equatorial and a magnifying power of 244, used with the polarizing eyepiece by Professor Langley, but was seen also and quite independently by his assistant, Mr. J. E. Keeler, with a very much smaller telescope and a power of 80.

Observers in other places noticed light spots in the surface of Venus, some suspecting them to be snow-fields.

The observations of Professor Eastman, at Cedar Keys, Florida, were quite successful, though the first contact was lost by the intervention of a cloud. The second contact was obtained very well; no black drop or ligament was seen, and the limbs of Venus and the sun were very steady. The sky was mostly clear from 11 o'clock to 1h. 40m. One hundred and fifty photographs were taken with dry plates and thirty with wet plates, all good. The third and fourth contacts were very well seen, with no black drop.

The observations made at Yale College were much impaired by clouds. Professor Waldo reports over one hundred and fifty photographs, showing the full sun with a reference line from a horizontal mercurial surface photographed at the same time. The heliometer observations were particularly successful, and the definition of the sun in spite of the clouds was such as enabled the atmosphere of Venus to be clearly visible in the heliometer, and the silvery aspect which this atmosphere assumed between the third and fourth contacts was clearly discerned.

Considerable good work was done at Cambridge Observatory. The German astronomers at Hartford, Conn., secured eight sets of observations with the heliometer. The German party at Aiken, S. C., were less fortunate. The French observers at St. Augustine, Fla., had a clear day. All the contacts were perfectly taken, two hundred photographs were secured, and many micrometrical observations were made. Professor Asaph Hall and the Belgian party at San Antonio, Texas, missed the first two contacts, owing to clouds. The last pair were taken perfectly, no black drop or point of any kind being seen. Professor Houzeau obtained, in addition to these contacts, one hundred and twenty-five measurements. Professors Hall and Woodward got over two hundred good photographs.

At the Lick Observatory, Mount Hamilton, Colo., the day was splendidly clear, and many photographs were taken.

The European observers were generally thwarted by bad weather. Favorable observations are reported from Cape Town and Durban, South Africa.

Professor Davidson's party in New Mexico were favored with a clear sky and steady atmosphere. The contacts were clearly observed. Two hundred and sixteen excellent photographs were obtained, and a large number of measurements were made with great precision. Indeed, not a single item in the long programme of the day's work was missed. At nearly all the Mexican stations the weather was good. The observations of the French Commission in Puebla were entirely satisfactory.

Favorable reports are also made by observers in the West Indies and Central America. At Melbourne, Australia, successful observations were made, but observers in Queensland and Sydney were disappointed. The American party at Wellington, New Zealand, took two hundred and thirty-six photographs.

THE GREAT STATUE OF LIBERTY.

A large and enthusiastic meeting was held in this city November 28, to promote the subscription for the pedestal of Bartholdi's "Liberty Enlightening the World," to be presented to the United States by the French nation and erected on Bedloe's Island, New York Harbor. A number of addresses were made by prominent citizens.

The chairman of the committee having in charge the collection of money for the pedestal, Hon. Wm. M. Evarts, after reviewing the circumstances under which the project was started in our Centennial year, said that a communication had just been received from the Committee of the Franco-American Union describing the popularity of the project in France. As early as the year 1881 the enterprise had been indorsed by 181 towns in France, acting through their municipal council, by 40 general councils of as many provinces, by all the chambers of commerce of the great cities of the republic, and by 100,000 individual subscribers. The statue will probably be ready for transportation next summer.

Touching the magnitude of the proposed monument, Mr. Evarts said:

The simple statue will be, from the plinth to the top of the torch, 145 feet in height. From the water level up to the highest point in the span of the Brooklyn Bridge is but 135 feet—10 feet less than this truly colossal statue. The dimensions of the plinth, the space occupied by the feet and drapery of the figure, is 40 feet square—as large as a house. It is fitting that so noble a monument of skill and industry, so generous a contribution, should be framed as a munificent gift from the French people, as one of the great evidences that the great international relations of value and importance between great countries are no longer maintained by courts and cabinets, but spring out of the intermingling pulses of the people.

The great Colossus of Rhodes, known in its time as the seventh wonder of the world, was erected to show the gratitude of the Rhodians to the Egyptian king who was their ally in war when their liberties were threatened by the King of Macedon. They were a small people, inhabiting an island of but 450 square miles, but that great work of theirs was erected at a cost of 300 talents, of the value then of between $400,000 and $500,000. It was but 105 feet high. This statue of Liberty Enlightening the World will be 145 feet high, upreared upon a pedestal of equal height, and will be, not the seventh wonder of the world, for the wonders of the world are never ceasing in number, but will be the wonder of the world as much greater than the Colossus of Rhodes as the world now, of which it will be the wonder, is greater than the world of the Mediterranean Sea in classic times. The largest modern statue is the one near Lake Maggiore, in Italy, erected to the great Christian saint, Charles Borromeo, which, upon a pedestal 40 feet in height, is in itself 66 feet high. Nothing in the history of the world has approached the greatness of this statue of Liberty. Our genius did not conceive so great a statue; our art and our munificence have not contributed to its production. This great free gift we are simply called upon to receive, to place upon a perpetual site under the perpetual care provided by the Government of the United States, on a pedestal that comports in dignity and in solidity with the statue it is to bear up, and which shall comport with the wealth and the numbers of these great cities and this great country, and show our appreciation of the debt we can never repay to France, and which she simply adds to by this magnificent gift. The numbers of those who will come hither to see the light of this commemorative statue no man can count, and they shall not cease coming until liberty itself shall have ceased to enlighten the world, nor until this home of the free shall cease to attract the footsteps of the multitudes that seek this shrine and this safety for their love and exercise of liberty.

All the conditions of our acceptance of this great conception and great execution are already fixed. The French have spent $250,000 upon the statue, and the best computation, without unnecessary expense, fixes the cost of the pedestal at $200,000 to $250,000.

THE PROPOSED COTTON CENTENNIAL.

The great success of the cotton fair at Atlanta, and the resulting advantages to the cotton growing States, have led to a still more ambitious project, which the South ought not to allow to fail. It is nothing less than a World's Fair in commemoration of the hundredth year of the cotton industry of this country. The first shipment of American cotton across the Atlantic was made in 1784, when eight bags were sent to England, where the cotton was seized by the customs officers on the ground that it could not have been grown in the United States, and was therefore liable to seizure under the shipping acts as not imported in a vessel belonging to the country of its growth.

The National Cotton Planters' Association of America are responsible for the proposition and the choice of date for holding the fair, and are now waiting to see which of the commercial cities of the South will subscribe the half million dollars for the choice of location. In a recent press communication the President of the Association, Mr. F. C. Morehead, says:

"It is proposed to raise not less than $2,500,000, one-fifth of which, at least, will be required as a subscription from the city securing the exposition. Every kind of machinery used in the manufacture of cotton is expected to be exhibited in motion and at work just as in the factory. The utmost importance will be attached to exhibits of improved

plantation machinery and agricultural implements, and special inducements will be offered with a view to placing before the planters and farmers the most approved appliances for successful diversified farming, the encouragement and stimulation of which is one of the chief missions of the National Cotton Planters' Association and one of the chief benefits hoped to be derived from the proposed exposition."

Under proper direction such an exhibition could not easily fail to be popularly successful and of great benefit all around. Though the chief benefit would accrue to the cotton growing States, the cotton manufacturers, machine builders, and makers of agricultural implements and machinery throughout the country would share in the general profit.

The South is to be the region of the greatest natural and industrial development during the next two or three decades; and nothing is better calculated to hasten such development than the demonstration of the capacities, needs, and possibilities of the Southern States by means of great popular expositions of their resources and requirements.

THE TRANSIT OF VENUS AS SEEN AT THE SEAGRAVE OBSERVATORY.

The transit of Venus on December 6 was as successfully observed as the clouds would permit at Mr. F. E. Seagrave's private observatory in Providence, Rhode Island. The telescope is a fine instrument of eight and a quarter inches aperture, made and equatorially mounted by Messrs. Alvan Clark & Son, of Cambridgeport. The observatory is of the first order, including every kind of apparatus that will furnish aid in astronomical research. The owner of the observatory is a young man, endowed with a natural taste for astronomy, zealous and untiring in the investigation of the science, and possessing ample facilities for the pursuit of his favorite study.

The contact and photographic methods were used in the observations made during the transit.

The polar and equatorial diameters of the planet were measured by means of a double-image micrometer. The contacts and general course of the planet were observed by Mr. Seagrave through the large telescope in the observatory, the aperture having been diaphragmed or cut down to three inches to make it available.

A small building erected for the purpose was devoted to the photographic work in charge of skillful operators. An able assistant had charge of the three-inch telescope, stationed in the open air, and used for the micrometrical measurements of the planet's diameters.

The observing party was promptly on hand to commence work as soon as the sun should appear. A few minutes before the time for the momentous event of the day, the great luminary burst forth from the encompassing clouds and shone from a clear sky. But at the critical moment, a dark cloud flitted over his face, and the first external contact was lost. When the cloud passed, Venus had made the entering notch and was partially on the sun's disk, the view being unimpeded until she was entirely on his face and had made her first internal contact, the observed time differing a minute and three-quarters from the predicted time. This aspect was very satisfactory, for Venus left the sun's border without any appearance of the connecting ligament known as the "black drop," while the film of light surrounding her proved the existence of an atmosphere beyond dispute. As the transit progressed, the sky was by turns clear and obscure until 2 o'clock, when the clouds became masters of the situation, and the scientific work virtually ended, though glimpses of the planet were occasionally obtained as she reached the second internal contact, and finally, arriving at second external contact, made her exit into the immensity of space, where she was lost to view. Every moment of clear sunshine was improved in photographing the sun with the planet on his disk, and twenty-three excellent pictures were the result. Several measurements of the planet's polar and equatorial diameters were made, which are yet to be reduced. Thus the Seagrave observatory contributed its share to swell the roll of observations that must be multiplied like grains of sand upon the seashore before certainty can be reached. It is probably the last time that so much scientific stress will be laid upon a transit of Venus. For before the next one, in 2004, we have faith to believe that other and more accurate methods will be found for computing the sun's distance.

Independent of the scientific work accomplished, there was the highest kind of enjoyment in watching the grand phenomenon itself. Through the large telescope, Venus looked like a sphere of inky blackness, larger than the full moon, and crowned with a film of light. She filled nearly the whole field of vision, only a small portion of the sun being visible outside of her, and this was paled into bluish white light, by the colored eye-piece that alone made it possible to behold the solar brightness. Through a three-inch telescope the aspect, though not so wonderful, was far more interesting. Here she looked as large as a ball that children play with, black as ink, moving serenely over the sun's disk, the whole lower limb of the sun being easily brought into the field of vision. Through smoked glass, the eye could just discern the planet passing like the head of a black pin over the sun's face.

The view in the small telescope was the most suggestive of the whole. Here, apparently, is a little black ball easily held in the palm of the hand, clinging to the sun's surface as it glides over it. In reality, the little ball is a great globe almost as large as our own, dwindled into tiny dimensions by a distance of twenty-five million miles, and separated from the sun, on which it seems to hang, by a distance of sixty-seven million miles.

The transit of Venus is a feature of special interest, a mirror in which we may see the semblance of our own planet. For as Venus looks to us, so does the earth look to observers on Mars when she makes her transit over the sun. Perhaps, while we watch the transit, observers in Venus are watching the earth. It is night on the beautiful planet, for the dark side is turned toward us. In the starlit sky arching above her, a star rises when the sun sets, and shines through the entire night. This brilliant evening star is the earth in opposition, and, accompanied by a tiny moon, she is larger and more brilliant than Venus ever appears in our sky. For when we see Venus in her brightest phase, she is a crescent. When, observed from Venus, the earth is seen in her brightest phase, her whole illumined disk is turned toward her sister planet.

A POSSIBLE FIELD FOR RAILWAY ENTERPRISE.

Some of the English papers are discussing the merits of a system of freight roads proposed for the manufacturing districts of Lancashire, England. In that region a vast amount of material, raw and manufactured, is subject to transportation for short distances. The railway charges are exceptionally high, and the cost of repeated handling adds materially to the burdens of manufacturers and dealers. For instance, a bale of cotton received at Liverpool is lifted out of the ship's hold and deposited on the quay. It is then lifted upon a cart and hauled to the railway station. There it is unloaded, and after one or more handlings is reloaded in a freight car, and after a long succession of shuntings the car is marshaled into its proper train and started for Manchester. Here another series of handlings are in order, ending with the delivery of the cotton at the factory. From the mill back to the ship, the manufactured cloth is subject to the same treatment, largely enhancing its cost to the shipper. Indeed, owing to multiplied handlings and excessive railway charges, the cost of sending goods from Liverpool to Manchester is said to be actually greater than it used to be before railways were introduced.

The magnitude and urgency of the traffic forbid a return to the old cartage system for the whole journey; so a compromise is proposed in the form of a "plate way," on which ordinary wagons are to be hauled by steam motors.

The estimated cost of the plate way and its equipment is about $175,000 a mile, which would build a respectable railway in the American style. Obviously, the carrying capacity of a plate way used by ordinary road wagons would be much less than that of a regular railway.

The question arises whether the avoidance of repeated loading and unloading of freight could not be secured, and all the advantages of the railway retained, by simply transporting the loaded wagons upon properly constructed flat cars, to be hauled by locomotives in the usual way.

Of course this plan would be feasible only where the railway carriage was short, compared with the rest of the haulage, as, for example, between the wharf or warehouse of the city and the factory in the suburbs or in a near-by town, or between an outlying market garden district and the city market.

In many American cities from which railways radiate to all points of the compass, this method of transportation might prove decidedly economical, especially in saving repeated and destructive handlings of fruit and vegetables brought in from the surrounding country. The farmer's loaded wagon might be hauled upon a platform car, as upon a ferryboat, and carried with its team and driver to the city station, whence it could proceed to market without delay. Or those whose market business is extensive might have relays of horses and drivers, and send the loaded wagons only by rail.

Vast quantities of farm and garden produce are hauled in road wagons fifteen or twenty miles to city markets. Railway facilities for the larger part of the distance, and for distances considerably beyond the present range of road haulage, would seem to offer many advantages; while the saving in time and wear and tear of wagons, harnesses, and teams would amply offset reasonable railway charges.

INVENTION AS A MEANS OF EDUCATION.

Young people are commonly dissuaded from exercising their native talent for invention by, or because of, the mistaken opinion that youth is exclusively a time for learning what others have done; that it is altogether improbable that any discovery or invention a young person may make can be either new or of any value. Any utility that a boy can recognize or develop, it is too commonly thought, must of necessity have been discovered and tried before; and it would only be a waste of time to reinvent old or impracticable devices.

This opinion involves two grave errors. In the first place, it is not always a waste of time to rediscover or reinvent, though there may be no immediate money profit to be got from such work. Original investigation and creative thought have a high educational value always; and the profitable art of invention is best acquired by inventing, even though fifty other men may have individually worked out the same practical problems before. For mathematical training, the patient and thoughtful solving of problems brings the same discipline, no matter how many other students have already solved the same problems. The skill which a young draughtsman may acquire in the work of sketching machinery off-hand is not lessened in any way by the fact that the draughting-room of the machine shop is full of much more perfect drawings of the same machinery than he can hope to make.

In like manner the time of the young inventor may be most profitably employed in inventing, even when it turns out that the product of his labor is nothing new. Indeed, there is no better way for the young inventor to acquire skill in his art than by resolutely working out (to him) novel problems the best way he can, even when he knows that they have been satisfactorily solved by others; then comparing his invention with the products, it may be, of older and more experienced minds. The skill so gained will tell in his favor when he strikes a problem that is entirely novel.

The other error referred to is the assumption that the inventions of young people are not likely to be of any value. The history of invention is full of illustrations to the contrary. A recent instance is recorded in a morning paper. A young lad in the Cooper Institute class in mechanical drawing has devised a simple attachment to the ordinary bath tub, by means of which any bath room is enabled to furnish every variety of baths, Russian, spray, vapor, medicated, or other, as may be desired. The *Herald* says that one apparatus has been manufactured and placed for trial in the French Hospital in this city, where it is being experimented with in the treatment of rheumatism and acute nervous diseases by spray baths permeated with drugs. The same contrivance, attached with rubber tubes to the faucets of a wash-bowl, serves to produce vapor impregnated with chamomile or other herbs for inhalation in cases of bronchial affections. A number of physicians have called to see the young inventor, and all commend the invention, but express surprise that something of the kind was not produced long ago.

That is the usual way. When an invention is made, the wonder is that no one has ever seen the way to do it before.

It is safe to say that there is not a single article in every day use that will not sooner or later be greatly improved: we do not see the opportunity now because we are blinded by habit. It requires a novel point of view to make the requirement visible; and to a large extent the keen eyes of youth, if encouraged to be critical, are best situated for taking novel views of things. And bearing in mind the truth that the most profitable field of invention, all things considered, is in connection with matters of every day use by everybody, the common custom of discouraging the efforts of young people in this direction, however crude at first, is far from wise. The habit of mentally challenging the economic right of everything in common use to fill the position it occupies, of asking what its real function is, and whether it might not be bettered or possibly displaced entirely by something cheaper, handier, or more efficient, is one of the most promising habits that the young can acquire. There is money in it, and public benefit as well.

TEMPERING STEEL.

More tools are ruined by overheating, cold-hammering, and over-tempering than can be redeemed by all the new receipts that have been invented. The only way that is really good, is first to find a brand of steel that is good and suitable for the tools to be made, and stick to it. Next find by a few trials the lowest heat that will harden it in pure water at 70°, or ordinary shop temperature. If steel is hardened at the lowest heat, the temper will require drawing very little, *i. e.*, to a pale straw, full straw, or brownish yellow, but not deeper unless for wood working tools with thin cutting edges, when a full brown may be desirable.

File makers use salt water for a hardening bath, because it makes the water more dense and the teeth harder and of course more brittle.

Sulphuric acid or mercury is sometimes used for hardening very small tools for cutting glass and etching stone.

For springs the same care should be taken in regard to low even heating that is necessary with tools. Pure lard oil is as good and probably better than any of the many mixtures that have been tried for the hardening fluid; burning off may do for drawing the temper of small or thick springs, but is totally unfit for long or slender ones.

Dip the hardened spring into a bath of oil heated nearly to its boiling temperature; this is the only way to get an even temper.

Bisulphide of Carbon Lenses.—Proportions of Lenses.

We say, in reply to a correspondent, that we do not know of any telescopes with bisulphide of carbon correcting lenses having been made of late years. They were never a success. It requires the grinding and polishing of four surfaces for the correcting lens, and as there are no formulas, to our knowledge, for the bisulphide, you will have to make an experimental trial. For your front glass, you may make the curves one to six or nearly a plano-convex flat side next the eye, the radius of shortest curve about six times the diameter of the lens. For the correcting lens, the diameter should be not less than one-third the diameter of the front lens. Its general form should be plano-concave; and as the dispersive power of bisulphide is more than three times as great as crown glass, its refractive power being about 50 per cent greater, you may make the side next the object glass plane, and the side next the eye convex on the inner side and plane next to the eye, if convenient to do so. This will require only one curve to be altered for final correction. To start, make this curve the radius of the first surface of the front lens, and place the lens about one-third the focal length of the object glass from the eye.

ICE MAKING AND REFRIGERATION.—THE PICTET PROCESS.

The Pictet process beautifully illustrates how a liquid in the act of volatilization absorbs heat, so as to freeze bodies with which it is in contact, and which, upon condensation, gives out the heat it had just taken up.

The artificial production of low temperatures is based upon the property of all bodies, whether solid or liquid, to absorb or take up heat while in the act of expanding; and the more volatile the body, the greater its power of accumulating heat and retaining it in a latent condition in itself. What such a body gains in heat, surrounding bodies lose. For instance, anhydrous sulphurous oxide, escaping in the air from its liquid state, produces a fall of temperature of 135° Fahr. A given quantity of the liquid will instantly freeze several times its own bulk of boiling water. While the physical law has long been known, the problem until recently has been to select the liquid and invent the machinery for its practical utilization. The liquid must volatilize spontaneously when allowed to expand; the machine must control the expansion, and reutilize the liquid, and the disadvantages of different liquids must be offset against their advantages.

It is claimed that the Pictet ice machine, which employs sulphurous anhydride, has attained a higher degree of excellence than any yet invented, its prominence in the market securing for it a more worthy distinction than even the prizes won for it at international expositions. As to the liquid, there has been a variety of liquids used for this class of machines in general, having different merits. Ammonia has high power or range of condensation and expansion, and was the element first used for the production of cold. Briefly, it is held in solution in water, and by the application of heat is vaporized or released from the water and passes into gas, takes up the heat surrounding it, and is brought again into contact with water, and returned into the retort to be revolatilized. The disadvantage of this machine is the great pressure to which the containing vessel is necessarily subjected, being 240 to 300 pounds per square inch, while that in the Pictet machine is only 85 pounds per square inch at its highest pressure. To this danger must be added the fact that the liquid is highly corrosive and gradually destroys the vessel designed to resist the already severe strain. Another recognized disadvantage is the use of heat to volatilize instead of the more efficient and controllable mechanical means used in the Pictet machine, and which could not be applied to the former.

Another objection to the use of these ammonia absorption machines is their intricacy and the absolute necessity of constant and watchful attention, it being unsafe to leave the apparatus for even ten minutes at a time, whereas the Pictet machines require only such casual attention as suffices in the running of any ordinary steam engine.

It must be borne in mind that in the construction of all machines, and in the use of materials, the advantages and disadvantages are to be contrasted.

The energy of the anhydrous sulphurous oxide is released by the simple removal of pressure which is controlled by mechanical appliances. Its economy is wonderful; it is very remarkable that a machine of this make has been known to run for six months with the loss of only 6½ pounds of the oxide.

The construction of the machine and the method of its operation are very simple. The liquid to be volatilized is put in a copper cylinder free from moisture and air. At this time it has no cooling effect. Part of it is now released by the action of the pump. This relief of pressure allows the liquid to expand and volatilize spontaneously, and, as has been explained, this volatilization enables it to absorb the heat contained in bodies in contact with the refrigerator, and hold it latent in the condition of latent heat. After absorbing the heat previously from the surrounding body, it is forced by the action of the pump into a condenser, where it is cooled to the temperature of running water, that is to say, a temperate degree of heat, when it liquefies, and then flows into the refrigerator to be volatilized by the removal of pressure, to repeat the cooling process.

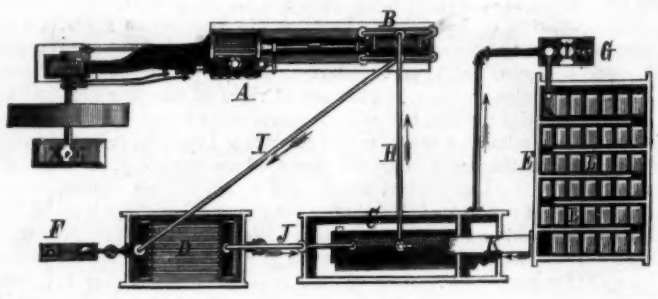


Fig. 4.—GENERAL PLAN OF ICE-MAKING MACHINE.

The accompanying cut, Fig. 4, serves to illustrate the principle and process.

A, horizontal engine; B, compression pump directly connected with the engine; C, refrigerator and tank; D, condenser and tank; E, freezing tank holding cans for ice blocks; F, pump for circulation of water; G, pump for circulation of brine; H, copper pipe for conducting gas to compression pump; I, copper pipe for conducting gas from compression pump to condenser; J, copper pipe connecting condenser and refrigerator; K, overflow from freezing tank to refrigerator tank; L, ice cans.

Refrigerator C is placed horizontally in the tank, through which an uncongealable liquid (chloride of magnesium) is circulated. The moulds or ice cans may either be placed in this refrigerator tank or in a separate tank as shown. The sulphurous oxide is volatilized in the refrigerator, C, by the pump, B, which draws the oxide from the refrigerator through the pipe, H, producing intense cold, which is communicated to the surrounding liquid, and the pump then forces the vapor through the pipe, I, into the condenser, D. The condenser is a series of copper tubes; a current of cold water is kept constantly flowing through the condenser tank and about the tubes, which abstracts the heat from the vapor and brings it back to a liquid form. The pipe, J, returns the liquid sulphurous oxide to the refrigerator to be revolatilized, while a stop-cock regulates the supply. The compression pump, B, used is double-acting, and of iron. The piston is of metal, without packing. Its action is very easy, owing to the lubricating nature of the oxide.

It will be readily seen that the water in the cans, L, is frozen into solid blocks of ice by the cold brine in the tank, which is several degrees below the freezing point, and that there are no chemicals or gases that can possibly affect the ice in color, taste, or smell. If the water is pure, the ice made from it will be equally pure, if not more so. The blocks of ice vary in size according to the different capacities of machines.

We present three illustrations of the machinery for practical application of the process. Fig. 1 is the manufacture of ice as a merchantable article. What nature affords precariously in the winter season is here systematically produced winter and summer in all climates. That which is produced in the tropics under a torrid sun is as real and as good ice as that which is produced by nature in the Alps. The illustration shows the cans or forms filled with pure water set in the uncongealable liquid in close proximity to the rapidly volatilizing anhydrous sulphurous oxide. The water in the cans gives up its heat to this powerful agent and congeals into ice. This cut is drawn from works at Louisville, Ky.

Another illustration (Fig. 2) is the "refrigerating" process. It is not here intended to freeze water, but only to cool the air of a room in which meat is preserved. And this can be brought to a sufficiently low temperature to freeze, if required. The pipes are suspended along the roof of the storeroom, and through them continuously flows a "brine" reduced to a temperature below 32° Fah. The chilled air, by reason of a well known law, descends, while the warm air rises to be cooled, and both establish circulation and ventilation. This method may be adapted to vessels for ocean transportation as well as for storehouses. The pipes overhead are covered with a beautiful crystallization of moisture in frost.

This cut represents the meat market in the establishment of Armour & Co., at the Union Stock Yards, Chicago, Ill. The firm mentioned say:

"We are *more than satisfied* with our Pictet refrigerating machines, and consider them *the best in the market.* We have two of the largest size in full operation.

"ARMOUR & Co."

The same process of refrigeration is applicable to breweries. The pipes are suspended from the ceiling in the vaults, and as shown in the illustration, Fig. 3, absorb the heat from the rooms and casks. Apart from the necessity of pure water in brewing, uniformity of temperature is of

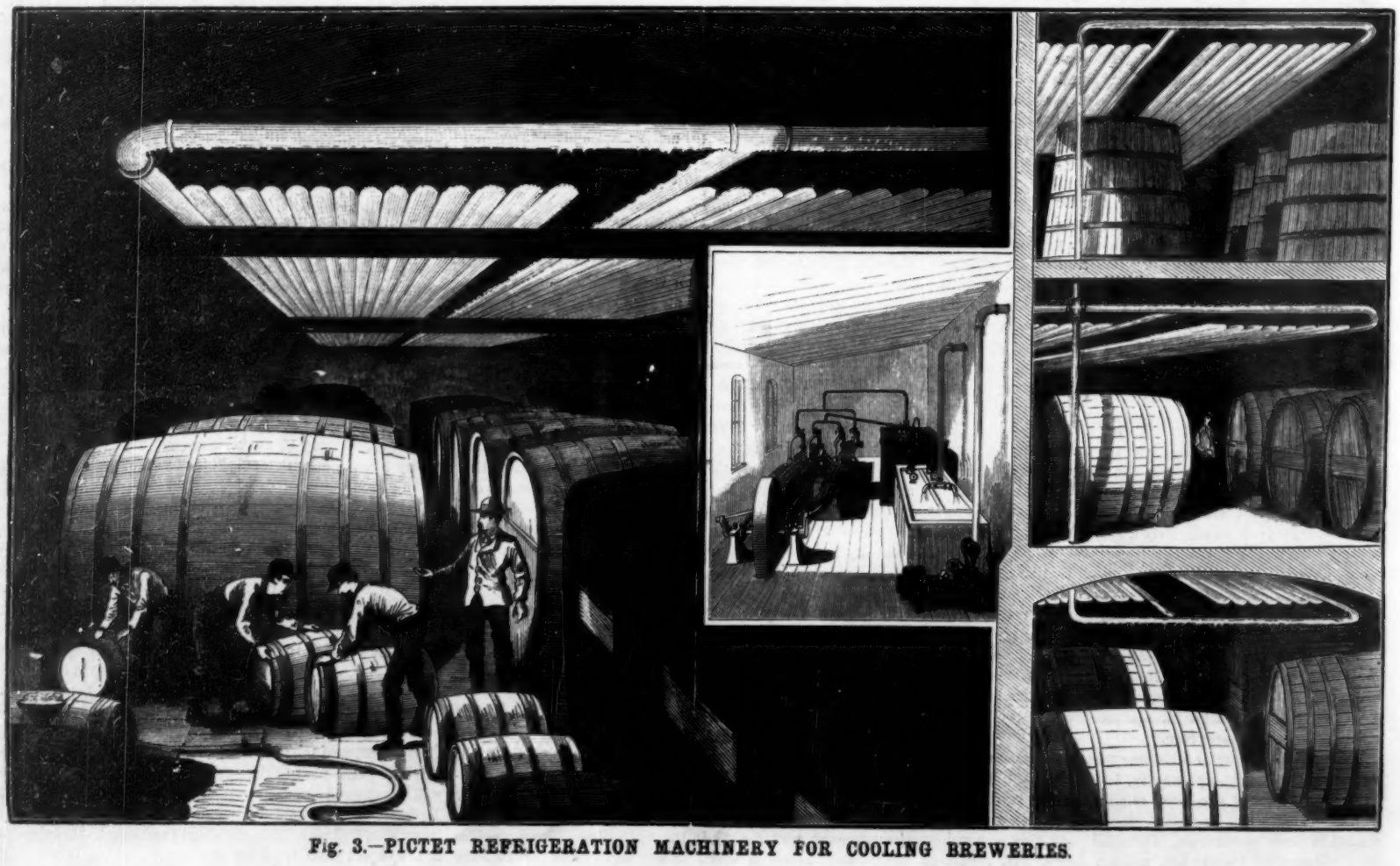


Fig. 3.—PICTET REFRIGERATION MACHINERY FOR COOLING BREWERIES.

paramount importance, and that can be secured and controlled irrespective of climate or seasons. The process is used on a large scale by:

Armour & Co., Union Stock Yards, Chicago, Ill. (50 tons); New Orleans Refrigeration and Manufacturing Company; Rohe & Bro., New York; Roth, Meyer & Co., Cincinnati, O.; A. Merkle, Zanesville, O.; Charles Lang & Co., Covington, Ky.; Henderson Coal and Mining Company, Henderson, Ky.; J. O. Powlis, Louisville, Ky. (25 tons per diem); Brenham Ice Company, Brenham, Texas; Rio Grande Ice Company, Brownsville, Texas; C. H. Lawrence & Co., New Orleans, La.; Huse, Loomis & Co., St. Louis, Mo.; Z. Wainwright & Co., Pittsburg, Pa.; Reymann Brewing Company, Wheeling, W. Va.; Russell H. Nevins, Lake Maitland, Fla.; S. H. Macrae, Granada, Nicaragua, C. A.; Rubsam & Horrmann, Staten Island, N. Y.; Peter Harley, Puenta Arenas, Costa Rica; L. Bon, Santiago, Cuba; and many others.

Anhydrous ammonia is also used, and vaporized and condensed by mechanical action of a pump upon the same principle as in the Pictet machine. But the resistance which ammonia offers to condensation is much greater than that by anhydrous sulphurous oxide, in round numbers about 600 per cent greater. For if we take a pump of say 11 inches in diameter, having a superficial area of 95 square inches, and multiply this by the Pictet pressure of 35 pounds per square inch, we have a resistance to be overcome at each stroke of the piston of 3,325 pounds, whereas if ammonia were used in this same sized cylinder with its pressure of 200 pounds the resistance would be 19,000 pounds to be overcome at each stroke of the piston. One great advantage in the use of anhydrous sulphurous oxide is that the machines using it can be built of any metal, as this gas has no effect upon any.

The Pictet machines, with the exception of the pump and engine, are built entirely of copper and are practically indestructible. Ammonia corrodes all metals, though it has less effect upon wrought iron than other metals. In a short time it will, owing to its high pressures, actually "honeycomb" cast iron plates an inch in thickness.

Furthermore, iron being used throughout, the entire apparatus, with the exception of the pump and engine, is exposed to water, the condenser to fresh water and the refrigerator to salt water, and so the more or less rapid oxidation finally destroys the machine.

Another serious trouble arises in the machines using anhydrous ammonia from the necessity of oiling the gas pumps. The oil combining with the ammonia forms a stiff soap, and this is carried into all parts of the apparatus, and soon chokes up the tubes of both refrigerator and condenser, necessitating the frequent stoppage of the machine for the purpose of taking it apart to cleanse the pipes.

This amounts almost to a rebuilding of the apparatus, takes a long time, and often becomes necessary during hot weather, causing a stoppage of the machine of several days' duration, when its work is most needed. Anhydrous sulphurous oxide being a lubricant in itself, the pump of the Pictet machine is never oiled, and consequently it never becomes necessary to cleanse the interior of the machine.

An ice making machine of 1½ tons capacity can be seen in operation at the warerooms of the Pictet Artificial Ice Company, Limited, 142 Greenwich street, New York. A personal examination of this machine gives a very good insight, not only into the Pictet system, but also into the process and *modus operandi* of the machinery, which is exceedingly simple, economical, and efficient. The company build ice making machines of different capacities varying from 1,200 pounds to 25 tons of ice in twenty-four hours; also air cooling machines especially constructed for cooling breweries, pork packing establishments, cold storage warehouses, hospitals, etc.

Further information may be had on application to the company whose address is given above, and whose advertisement may be found in another part of this paper.

THE new ship canal which is to connect the Baltic and the North Sea will save nearly 600 miles of the water journey now made around the Danish peninsula. The cut, as proposed, will be from Gluckstadt to Kiel, and the length will be about half that of the Suez Canal, or some fifty miles.

NOVEL ROAD VEHICLE.

The vehicle represented in the annexed engraving is a very novel and ingenious contrivance, as the reader will observe. Whether the invention is as useful as it is novel, is a matter of considerable doubt. It consists of a ring within which the seat of the rider is supported by a frame provided with three or more small grooved wheels resting against and running on the inner edge of the ring. The frame is provided with an axle carrying a balancing or staying wheel at each end, and with a mud guard and thills to which two hinged rings, provided with a saddle, are attached for hitching the horse to the thills. The vehicle is made entirely of iron, and is balanced by the side wheels and the thills. If the road is very narrow, the side wheels can be dispensed with. The vehicle is specially adapted for country roads and for the use of mail carriers, sportsmen, etc., it is claimed by the inventor, Mr. F. von Grubinski.—*Neueste Erfindungen und Erfahrungen.*

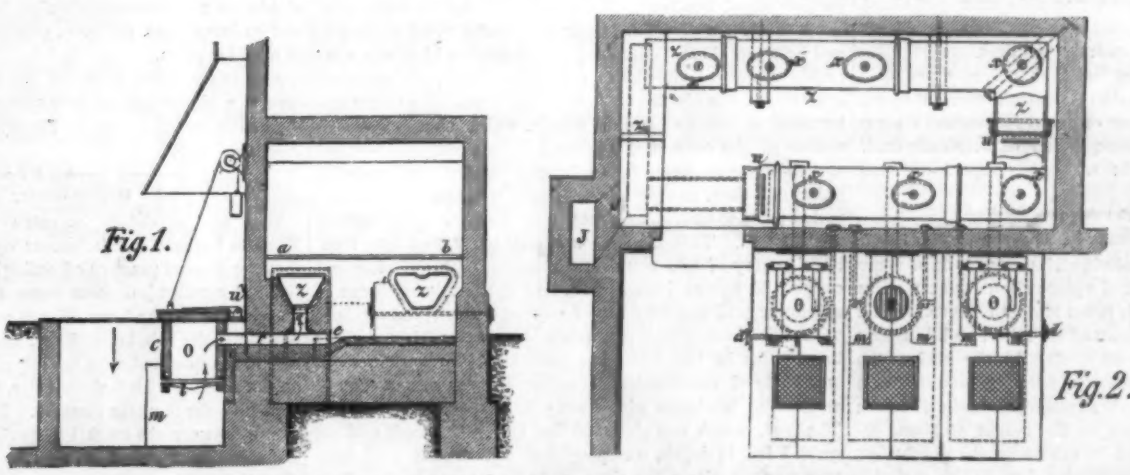
NOVEL ROAD VEHICLE.

OBERSTADT'S MELTING FURNACE WITH DRYING CHAMBER.

Generally, small furnaces in which metals are melted in the crucible are united closely to a chimney; and often there is added to the melting furnace a drying chamber for cores and small moulding frames, although it seems preferable to separate the drier from the furnace, since the long flat channels of these driers become easily choked up with ashes, and respond only imperfectly to the end in view.

The inconveniences attending the ordinary arrangement of these apparatus appear to be entirely got rid of in the furnace shown in Figs. 1 and 2, and described by Mr. Oberstadt in his work entitled "Die Technologie von Eisenbahnwerkstätten." Cast iron boxes constitute here heating flues which may be easily cleaned and freed from ashes, and which serve at the same time as tables for the frames to be dried.

The furnace consists of wrought iron cylinders, *c*, provided at their lower extremity with angle iron rings, upon which is arranged an inner lining of refractory bricks. The fireplaces rest on walls, *m*, which are also lined with firebricks, and are anchored by the rods, *d*, and carry the grates, *l*. Channels, *r*, with register at *e*, for convenience of cleaning, lead the gases due to combustion through small tubulures, *o*, into the horizontal iron smoke conduits, *z*, and from thence into the chimney, J. The upper wall of these conduits is arranged so that it may serve as a table for the cores and frames to be dried. The cleaning of the conduits, *z*, is effected through the apertures, *x*, which may be closed by covers. The extremity of these conduits are connected by a channel, z^1, which is covered by two cast iron plates, *a* and *b*, placed one alongside of the other, and which are likewise utilized as drying tables. Registers, *u*, permit of regulating the direction of the hot gases, and, consequently, the temperature of the drier.



MELTING FURNACE WITH DRYING CHAMBER.

Mother-of-Pearl.

This beautiful material, which is so much used in many kinds of artistic productions, is chiefly obtained from the pearl oysters (*Meleagrina margaritifera*) which are found in the Gulf of California, at Panama and Colagua, at Ceylon and Madagascar, at the Swan River in Manila, and at the Society Islands. The black lipped mussels from Manila bring the best prices. The Society Islands produce the silver lipped mussels, and Panama the so-called "Bullacks."

The peculiar and varied tints and colors exhibited by mother-of-pearl are due to the structure of the surface, which is covered with innumerable fine plates—often several thousand to the inch—which break up the rays of light falling on it, and reflect it in all different tints. The oyster pearl has a lamellar structure, and can actually be split off in scales, but they are very rarely divided in this way, as there is always danger of destroying it. In working mother-of-pearl, says Wieck's *Illustrated Art Journal*, the saw, file, and polishing stone play the principal parts. A mussel shell is selected that is covered with the peculiar pearly substance to such a thickness as is necessary for the work in hand.

The square or angular pieces are sawed out with a small saw, the piece being held in the hand or clamped in a vise. Buttons and similar round pieces are cut with a crown saw attached to a spindle. All the tools employed in working mother-of-pearl must be kept continually moist to prevent their sticking fast. The pieces are generally shaped on a polishing stone, the rim of which must be ribbed to avoid daubing and smearing. The stone, of course, must be kept wet while in use; a weak soapsuds works better than water alone. When the pieces have been brought to the proper shape on the stone, they are then polished with pumice and water. In many cases it is well to shape the piece of pumice so as to fit the form of the article to be polished, and then the latter can be fastened to a handle and rotated in a lathe. It is afterward polished with finely powdered pumice on a cork or wet rag, while the final polishing is done with English tripoli, moistened with dilute sulphuric acid. The acid brings out the structure of the pearl very beautifully. In many articles it is necessary to use emery before the tripoli is applied, and then employ oil instead of acid. Knife and razor handles have the holes bored in them after they are cut in the proper shape, and are then lightly riveted together, polished on the stone, and finished as before described.

In many workshops the polishing is performed on wheels covered with a wet cloth which holds the polishing material. For common work some pulverized chalk or Spanish white is substituted for the English tripoli.

Mother-of-pearl is frequently etched like copper. The design is put on with asphalt varnish, which protects the parts that are not to be etched, and the piece is then put in nitric acid. When the exposed portions have been sufficiently corroded by the acid, the article is rinsed with water, and the varnish dissolved off with turpentine or benzole.

Thin pieces of pearl which are to have the same shape are glued together, and all cut and bored at once like a single piece, and afterward separated by putting them in hot water.

In ordinary inlaid work of mother-of-pearl, scales or very thin pieces of pearl are fastened on iron or some foundation, usually made of papier mache, with Japanese varnish. The plate is first cleansed and dried, then coated with varnish; when the latter is nearly dry, cut pieces of mother-of-pearl are pressed into the varnish by the artist so as to adhere to it. The plate is then baked in an oven until the varnish hardens, when a second coating is put over the entire article, which is then polished again.

Besides the white and aurora-like mussels above mentioned, the sparkling green snail shells sometimes find use; these exhibit dark or light tints of green, yellow, or pink, or one shade passing into another.—*Deutsche Industrie Zeitung.*

MR. WAKE, engineer of the River Wear Commissioners, and Mr. Irish, manager of the Northern District Telephone Company, in England, have made some interesting experiments in the use of the telephone by divers. The length of the cable connecting the receiver in the diver's helmet with the transmitter above water was 600 yards. It was found that the diver could converse with ease, and ask for tools in any position in which his work might require him to place himself.

Hydrogen Peroxide.

MM. Paul Bert and P. Regnard have studied the action of hydrogen peroxide upon various forms of organic matter and upon fermentations, and find that it possesses very remarkable antiseptic properties. All fermentation due to an organized ferment is immediately and definitely arrested by hydrogen peroxide, the ferment is killed, and even after the removal of the hydrogen peroxide by one of the substances which destroys it most rapidly, the fermentation does not recommence. The yeast of beer is in this manner killed instantly, although it possesses itself the property of decomposing hydrogen peroxide. Specimens of wine, urine, and milk, each containing a few drops of hydrogen peroxide, have been exposed for several months in open vessels without exhibiting the least sign of alteration, while other specimens of the same identical liquids, without the addition of hydrogen peroxide, placed beside them, were in a state of complete decomposition. Although organized ferments are destroyed by hydrogen peroxide, soluble ferments do not seem to be affected by it, saliva, diastase, the gastric and pancreatic fluids continue to act in solutions containing hydrogen peroxide. MM. Bert and Regnard have also studied the action of hydrogen peroxide upon various organic materials, including the albuminoid substances and all the tissues composing the animal body in a healthy or pathological state. The results of their investigations may be summed up as follows:

1. Hydrogen peroxide, even when very dilute, arrests fermentations due to the development of living organisms, and the putrefaction of all substances which do not decompose it.

2. It has no effect upon diastase fermentations.

3. Dilute hydrogen peroxide is not destroyed by fats, starches, soluble ferments, egg albumen, casein, the peptones, creatine, creatinine, or urea.

4. It is rapidly destroyed by nitrogenous collagens, by musculin, fibrin of the blood, and various nitrogenous vegetable matters.

5. This action is definitely arrested by a temperature above 70°. Putrefaction, however, leaves it entirely intact.

As it appeared from the powerful antiseptic properties of hydrogen peroxide that it might prove of value in surgery, experiments were made upon the point by MM. Péan and Baldy at the hospital of St. Louis, with very successful results.

The hydrogen peroxide, in solutions containing from two to six times its volume of oxygen, according to the circumstances of the case, was used, both externally, as a dressing for wounds, ulcers, etc., and also given internally in certain affections, in doses of from three to five grains, containing six times its volume of oxygen. As a result of their experiments, MM. Pean and Baldy consider themselves justified in stating:

1. Hydrogen peroxide containing, according to circumstances, from two to six times its volume of oxygen, appears to be capable of advantageously replacing alcohol and carbolic acid.

2. It can be employed, externally, for the dressing of wounds and ulcerations of all natures, in injections and in vaporizations, and internally.

3. The results obtained, even in the case of the largest operations, are, up to the present, in the highest degree satisfactory. Not only fresh wounds, but also old ones, proceed rapidly to cicatrization, and reunion by first intention of amputation wounds appears to be encouraged by this mode of dressing.

4. The general as well as the local state appears to be favorably influenced.

5. The advantages of hydrogen peroxide over carbolized water are its not having any poisonous effect nor unpleasant odor, while its application is entirely painless.

M. Bert calls attention to the fact that hydrogen peroxide for surgical use must be entirely neutral, while that obtained from the greater number of dealers in chemicals frequently contains a considerable quantity of sulphuric acid, so that its use would not be without danger.—*Comptes Rendus.*

Alleged Human Footprints in Tennessee Rocks.

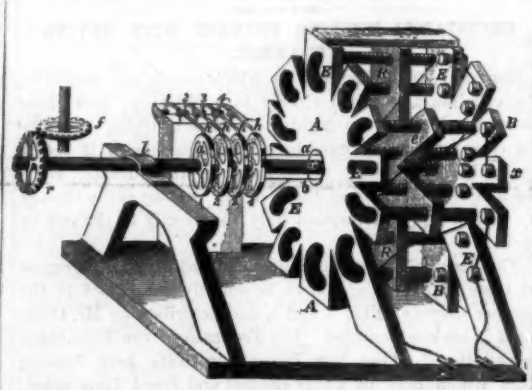
A correspondent of the Nashville *American* tells of some curious footprints in sandrock at a place about twenty miles west of Nashville. "At this point Harpeth River forms a horseshoe bend, making a circuit of six miles, and doubling back on itself to within 80 or 90 yards. In the heel of the shoe rises a ridge, forming almost a perpendicular bluff on both sides, extending about half a mile south in the direction of the toe of the shoe. It rises to the height of about 400 feet, and at the highest point is not more than eight feet wide on the top, with a perpendicular face on the east side for 100 feet or more—that is, a plumb line suspended from the edge of the precipice at the top would hang clear for 100 feet or more before it would encounter any obstruction. The ridge at the bed of the river is some 90 yards wide, but the slope which brings it to that width at the bottom is mostly on the western side.

"At the highest point on the crest of this ridge is a flat surface rock, and on that rock are imprinted six and a half tracks of human feet. These tracks are indented into the rock as much as a quarter of an inch, or in some places more. The tracks are of bare feet, toes all pointing in the same direction—toward the east. Most of the tracks are as perfect as if they had been imprinted on moist sand or earth. They are in three pairs. The first or largest pair is furthest north. They are less than the average size man's foot, and larger than the average size woman's foot, one a little in advance of the other. The next pair is on the south side, but near to the first. In size and appearance they represent the tracks of a child fifteen or eighteen months old. The track of the right foot of this pair is turned in a little at the toes, and the toes of that foot are turned down, as we often see children, when first learning to walk, seem to endeavor to clutch the floor with their toes, as if to avoid falling or slipping. The topographical relation of these tracks to the large ones indicates that the child might have been holding to the finger or hand of the larger person.

"South of these little tracks, but near to them, is the third pair, indicating a child some four to six years old. These last were made by a beautiful pair of feet, and are as pretty tracks as a child ever made in the dust or soft earth. All of these tracks are within three or four feet of the edge of the precipice on the eastern side, as already described. But I have said there was a half track, which is the most interesting feature on the tablet. This half track is printed on the very edge of the precipice, and represents the heel and hinder half of the foot from the middle of the instep back, and would indicate that the toes and front part of the foot projected over the precipice, or that the rock had broken off at that point. This half track is of the large size foot, or foot of the adult person, and is immediately in front of the large pair of tracks already mentioned."

THE FIRST ELECTRIC BOAT.

The idea of propelling a boat through water by the motive power of electricity is no new one. The invention of the electro-magnet showed the power of an electric current to produce a mechanical force. It was no very difficult matter, therefore, for the electricians of fifty years ago to utilize the force of the electro-magnet to drive small electro-magnetic engines; and from the small beginnings of Dal Negro, Henry, Ritchie, and Page grew up a group of electric motors which only awaited a cheap production of electric currents to become valuable labor-saving appliances. Nor was it a very long stride to foresee that if a sufficiently powerful battery could be accommodated on board a boat, it might be possible to propel a vessel with electro-magnetic engines



THE ENGINE OF JACOBI'S ELECTRIC BOAT, 1838.

drawing their supply of currents from the batteries. This suggestion—one of the earliest, indeed, of the many applications of the electro-magnet—was made by Prof. Jacobi of St. Petersburg, who, in 1838, constructed an electric boat. Fig. 1 which we here reproduce, says *Nature*, from Hessler's "Lehrbuch der Technischen Physik," represents the rude electro-magnetic motor or engine which Jacobi devised for the driving of his boat. Two series of electro-magnets of horse-shoe form were fixed upon substantial wooden frames, and between them, centered upon a shaft which was connected to the paddle-wheels, rotated a third frame, carrying a set of straight electro-magnets. By means of a commutator made of notched copper wheels, which changed the direction of the current at appropriate intervals, the moving electro-magnets were first attracted toward the opposing poles, and then, as they neared them, were caused to be repelled past, so providing a means of keeping up a continuous rotation. This machine was worked at first by a Daniell's battery of 320 couples, containing plates of zinc and copper, 36 square inches each, and excited by a charge of sulphuric acid and sulphate of copper. The speed attained with this battery did not reach so much as 1¼ miles per hour. But in the following year, 1839, the improvement was made of substituting sixty-four Grove cells, in each of which the platinum plates were 36 square inches in area. The boat, which was about 28 feet long, 7½ broad, and not quite 3 feet in depth, was propelled, with a convoy of fourteen persons, along the river Neva, at a speed of 3¼ (English) miles per hour.

Hods: Their Construction and Use.

Hods are of two kinds. One form of hod is devised for carrying bricks, and the other for the transportation of mortar. While differing somewhat in purpose and balance, the two species of hod are yet so closely allied as to be utterly indistinguishable when apart. Indeed, it is a matter of grave interest to men that during the whirl of centuries, when every other inanimate thing has, through the indomitable perseverance of invention, been forced through a process of evolution that has robbed it of almost every semblance of its pristine nature, the hod remains to-day in structure, substance, and design exactly as the hod originally was. At present hods are cheap. Eighty-four cents will purchase one. The craze for all that is æsthetic, early English, Japanese, Etruscan, or antique has passed by the hod unchallenged. The early Irish hod still reigns supreme.

The dimensions of a mortar hod are as follows: Length of bowl, 22⅜ inches; mean depth of bowl, 9⅛ inches; greatest width of bowl, 9¼ inches; height of back piece, 12⅜ inches; width of pieces forming lateral sections of bowl, 11⅛ inches. The dimensions of a brick hod, it will be seen, are different. They are as follows: Length of bowl, 23⅜ inches; mean depth of bowl, 8 inches; greatest width of bowl, 8⅛ inches; height of back piece, 10¼ inches; width of pieces forming lateral sections of bowl, 8⅞ inches. It is generally conceded that the mortar hod is built larger than the brick hod so as to make the weight when both are loaded as nearly equal as possible.

The shank or handle is 4 feet 2⅛ inches for each species of hod, and the shoulder rest is always 9 inches long, 3 inches wide, and 1¼ inches thick. This shoulder rest is attached to the inverted ridge pole of the hod, and prevents the edge from cutting into the shoulder of the proprietor.

Touching the materials used in hod building, it may be said that the earliest ideas still obtain. Iron hods have been tried, but abandoned, because they were liable to rust and to become cracked when dropped six or seven stories by proprietors, who invariably and instantly relinquish all ideas and implements of labor at the stroke of 12 and of 6. The verdict of ages is that the bowl of the hod shall be of yellow pine, and the shank a hickory pole with the bark on. In constructing a hod, it is found necessary to use thirty-three nails for the brick species, and twenty-nine nails and four screws for the kind intended for mortar. The screws are used in the latter instance to fasten the two arms of the shank to the bowl, because screws do not leave holes, as do nails when they become loosened. Small holes allow mortar to escape, and are therefore open to objections. In making the bowl of a hod, eightpenny nails are used; fourpenny nails answer best for the shoulder rest, and shingle nails for securing a narrow strip of sheet iron that runs over the top of the back piece of the bowl for the purpose of imparting additional strength. All of the nails are machine made, with the exception of those used in fastening the shank to the bowl, which are hand made and highly malleable. The mortar hod, besides having four screws, is lined at the seams with white lead. It has been considered somewhat superior to the brick hod. The weight of hods one hour after completion is ascertained to be exactly as follows: Brick hod, 9 pounds 6 ounces; mortar hod, 10 pounds 3 ounces. Fifteen bricks are carried in the common hod.

There is a widespread impression that the shank of a hod is steamed after being split into the V-shape necessary to accommodate the bowl. This is erroneous. The shank, after being slit for a distance of 7⅝ inches, is violently forced asunder by pressure against the wedge-like base of the bowl, and is secured while in that position.

Very many hods are owned privately, and many thousands more are owned by a large company up town, which makes hods and rents them to builders along with its patent hod elevators. The introduction of hod elevators, oddly enough, met with no opposition from individual proprietors of hods, but, on the contrary, was warmly welcomed by them. The elevators do the work of many men, but as building has increased in a satisfactory ratio, there has always been enough work for men who decided to adopt the hod as a means of advancement or sustenance. Indeed, so well have the individual hod proprietors in question adapted themselves to the existing state of things, that they absolutely refuse to climb higher than the second story now, and builders must, perforce, employ the elevators for stories of a loftier pitch.

At no time in the annals of the city has the hod industry been at a higher tide of prosperity. Thus the outlook for the hod is as bright as its history has been unvarying.—*New York Sun.*

The Digestibility of Oysters.

Why oysters should be eaten raw is explained by Dr. William Roberts in his lecture on "Digestion." He says that the general practice of eating the oyster raw is evidence that the popular judgment upon matters of diet is usually trustworthy. The fawn colored mass, which is the delicious portion of the fish, is its liver, and is simply a mass of glycogen. Associated with the glycogen, but withheld from actual contact with it during life, is its appropriate digestive ferment—the hepatic diastase. The mere crushing of the oyster between the teeth brings these two bodies together, and the glycogen is at once digested without any other help than the diastase. The raw, or merely warmed, oyster is self-digestive. But the advantage of this provision is wholly lost by cooking; for the heat immediately destroys the associated ferment, and a cooked oyster has to be digested, like any other food, by the eater's own digestive powers.

"My dear sir, do you want to ruin your digestion?" asked Professor Houghton of Trinity College one day of a friend who had ordered brandy and water with his oysters in a Dublin restaurant.

Then he sent for a glass of brandy and a glass of Guinness's XX, and put an oyster in each. In a very short time there lay in the bottom of the glass of brandy a tough, leathery substance resembling the finger of a kid glove, while in the porter there was hardly a trace of the oyster to be found.

The Practicability of Patents.

There seems to be no abatement in the number of patents issued weekly from the Patent Office on railway appliances. The average American genius is determined that there shall be *one* patent in kind, better than all others, and this is the stake he plays for. Even if there be already patented 999 devices for accomplishing a desired result, or perfecting a principle in railway mechanics, it does not follow, so thinks our inventor, that his patent will be another dead cock in the pit awaiting the resurrecting hand of appreciative capital; so he applies for a patent upon his car coupler, or track washer, or whatever else it may be, with a claim stated as broadly as may be possible upon an idea sandwiched between the existing 999 ideas of the same device "already gone before."

Taking out a patent is a comparatively inexpensive gratification, and the honor of being an inventor is something, because it is generally conceded by all right-minded people that inventors are thinkers. If we number our thinkers by the number of patents already issued on car brakes, couplers, track fasteners, and other multifarious appliances for railway purposes, there are a host of them in the United States. Judging from the number of this class of patents, the individual who can evolve a new idea without a twinge of infringement upon existing devices must have a thinking cap of a "higher order."

Herbert Spencer probably never took out a patent in his life, and perhaps he never will, as his thinking runs to the primitive order of things, not the progressive. His thinking is contemporaneous with the origin of the lever, the screw, the pulley, and the wedge, the four great mechanical powers —all of which we have the free and untrammeled use of without fear or hinderance from royalty lawsuits.

As soon as our inventor gets the necessary paper from the Patent Office, making him a greedy monopolist for seventeen long years, he has his invention aired in the *Rural Register*, and then with his model in hand he calls upon the nearest railroad manager, who is generally so case-hardened at the sight of these things that he causes a chilling sensation to seize upon those who have the temerity to invade his office with models of railway appliances. Our inventor is deeply chagrined at his reception. He expected to be received as a scientist, a discoverer of one of the lost arts; he is surprised that he is not told immediately to go and put his device upon every engine, passenger coach, and gravel car on the road—and at the expense of the company. Instead of this he is told that his device is not needed, and thus another disciple is added to the waiting army of cynics who believe that railway managers know not the good things of this life which underlie royalties.

The railway manager of the future will probably enjoy his *dolce far niente* and attend to business at the same time—at least our inventors seem determined that he shall do so, whether he will or not. The laborious routine and vexatious cares attendant upon railway operation will possibly become extinct. The railway superintendent, in the management of his road and his army of employes, will not only be autocratic, but automatic. He will move (automatically) his automatic train over his automatically laid rails, across bridges which will stand automatically, and the automatic train will be stopped by the automatic brakes at the station, where passengers, baggage, and express goods will be discharged automatically and received by an automatic agent. The passengers will ride and goods will be shipped per automatic rates, which will adjust themselves automatically to existing pools, thus avoiding a "war of rates." And the happy stockholders will weep for joy at the automatic evenness of dividends and the excellence of the automatic era generally.

We know that there are many meritorious patents not in use, and many of them never will be. They may be correct in principle, and their workings all that could be desired, yet the reason they are not adopted, it most generally will be found, is that they cannot supplant a cheaper substitute which answers the same purpose equally as well. Railway managers are not ready to adopt a new device simply because it is ingenious and "handy." Yet patentees cannot complain if their devices are not always used. In many instances they have patented articles for which there is no demand and very little use.

Our railway managers have taken up with many patents where they could see that the safety of lives and trains could be promoted by using them. Let any one examine the exterior of a passenger coach, and the interior also, and see how often and upon how many different parts he will find the word "Patented," and the date thereof. It is the same with engines, bridges, tracks, depots, ticket offices, as well as the shop machinery which gives employment to large forces of mechanics to keep these adjuncts of railway operation in repair. Although many of the articles mentioned may not have the word "patent" stamped upon them, a royalty for their use is paid to the inventor by the railway company. We have seen a street car in Chicago with the words painted on the inside: "Built under 75 Patents"—a brief way of enumerating the list. This certainly is not a moiety of the number of patents used by railway companies in the make-up of their plant. If as simple a thing as a street car cannot be constructed with less than seventy-five patents, what is the number in use in the make-up of a first-class passenger train?

We are indebted to the fostering spirit and protection of our patent laws for the best machinery and processes we have to-day in use in the agricultural, manufacturing, and railway world, and they have been the means of enriching hundreds of people. Out of the thousands of patents issued many are chaff and many are wheat. Our shrewd, practical business men have made the separation, which the inventor is rarely qualified to do.—*Railway Review.*

Drainage and Typhoid in Paris.

Again the grave increase of typhoid fever in Paris must, says the *Lancet*, call public attention to the extraordinary imperfections of the drainage of this "center of civilization." Most of the houses communicate direct at once with a cesspool and with the public sewers. That the water in these sewers is highly contaminated has been demonstrated over and over again by the death of all the fish in the Seine near the sewer outfall and by numerous analyses. No sink pipe is trapped in Paris, though it is sometimes conducted through the wall; where, as it measures only about two inches in diameter and joins the water spout junction, which is some four inches in diameter, the connection might be broken off and a sort of ventilation established. This, however, is carefully prevented by the use of a quantity of cement, so that the gases rising up the water spout are conducted straight into the house, attracted by the higher temperature of the interior.

Of late some of the iron pipes coming from the houses into the sewer have been bent upward at their extremity, and form a sort of spoon which retains a little water and is supposed to act as a siphon. But this is a mere illusion, as there is no "dip" whatsoever to the siphon, and the slightest pressure or the smallest ripple over the surface of the water, caused by wind or the falling of a heavy substance, would suffice to break the seal. We may therefore safely assert that an enormous majority of the Paris houses are utterly unprotected against the injurious emanations from cesspool and sewer. Further, many closets are utterly devoid of water supply, while in all instances the house drain pipes are much too large, and therefore cannot be kept clean, particularly when the fear of overflowing the cesspool necessitates a stint of water.

Over and above these considerations, the sewers themselves are so unsuitably constructed that they do not act, and it is consequently necessary to maintain, at great cost, an army of 800 men to literally push the heavy deposits along to the sewer outfall. Many of the small branch sewers also are so dangerous and foul that the men refuse to enter them, and these have to be left to engender disease, without even an effort to cleanse them. Finally, there is no organized method of ventilating the sewers. The necessity of sewer ventilation has not yet been recognized, and what ventilation there may be is of a purely accidental description. In fact, the houses, by reason of their superior elevation and temperature, are the most active sewer ventilators that exist, and it is not till after the sewer gas has been breathed by the inhabitants of the apartments that it reaches the streets or open air. Of course, the more elevated quarters of Paris are subjected to a stronger pressure of sewer gas, which in unventilated sewers generally tends to ascend to the highest points. Hence, typhoid fever is usually more prevalent at Montmartre, Batignolles, and along the course of the "collecteur du Nord."

It will take many years and a large expenditure of money to remedy all these defects; still the evils might be modified to some extent by the immediate introduction of good siphons at the junction of the house drains with the public sewers. Pending their reconstruction, the sewers might with comparative facility be ventilated, and police supervision could insure greater cleanliness within the houses. All this could be done pending the adoption of some comprehensive and general scheme of drainage; and, though such measures would not suffice to place Paris on a par with modern principles of hygiene, still they would save many valuable lives. Considering the large number of Englishmen who frequent the French capital and, by their lavish expenditure, enrich the hotel and shopkeepers of that attractive city, we have a right to complain of the risks our compatriots are compelled to incur when they visit Paris.

Curious Nesting Places.

A few years ago a pair of pewees built their nest on a brace under the guards of the steam ferryboat running between Portland and Middletown, Conn., the boat making trips every ten minutes. They seemed to claim Middletown as their home, as they appeared to collect their building material on that side of the river. When the boat was on this side they would wait patiently, sitting on the piles until she came into the slip, although I have occasionally seen them fly out and meet the boat in the middle of the river. "John," the veteran collector (he has been on this ferry thirty years), took quite an interest in them, and did what I doubt he never did before—let anything cross on this boat without collecting the fare. The birds did well, and we watched them until the young left the nest.

I have a bad habit of waking up about four o'clock in the mornings, and in summer, to keep out of mischief, I "pot" around the garden until breakfast time. One morning last spring I noticed a bluebird flying toward the house with her bill full of dried grass. I watched her, and you would never guess where she went with it—right into the kitchen chimney. The chimney has a flat stone on top, with openings beneath. I sat down and watched the pair work most lively until the cook came down and started the fire, when, as the smoke poured out, the birds left. Well, thinks I, you have given that up as a bad job; but the next morning they were at work as hard as ever. I waited for about ten days, when the cook complained that the fire did not seem to work right. "It didn't draw," she said. I went on the roof and took off the stone and looked in. The chimney is not a straight one, but has what the masons call a "draw off" in it. On that ledge, as you might say, they had begun their nest, and had finally nearly filled up the whole space in the chimney. In one corner was the nest as natural as life. I took a long wooden rake and carefully brought up and out the whole structure, and, if you will believe me, there was material enough to fill a half bushel measure.

I notice your remarks on "Coe's Strain," in October number. Had the usual luck this spring. Although I have had little time, I have managed to take the great horned and barred owls, a beautiful set of sparrow hawks, red-headed woodpecker, fine nest of white-bellied nut-hatches, and a few others of less account.

Took a chipping sparrow's nest with one of her eggs and one cow bunting's in it. The sparrow had built over the top of the nest a perfect network of horse hair, same as the lining of the nest, and so nicely that although one could see the eggs plainly it could be turned "bottom side up," and the eggs not fall out. I never saw this before in chipping sparrows' nests. "I put 'em in the bag" with the rest. Have a fine specimen of a chicken which I mounted a few days ago —perfect in every way except that he has four legs. What a sweet thing he would be in an early garden! I have a martin box on a pole some fifteen feet high. The martins came in the spring and stayed a few days, and then for some reason best known to themselves left. A pair of robins at once took possession and built a nest in one of the compartments, and when finished the old lady sat (?) set (?) sot (?) with her head out of the front window, showing that she was "at home."

But the sweetest of all this year is this: When I built an addition to my horse barn, I was obliged to cut down an old cherry tree, which I did, leaving a stump some six feet high, into which I placed a ring to hitch my horses to. One morning I noticed a pair of chickadees at work on the stump, and I gave them my closest attention. My man hitched the horses to this stump every morning as he cleaned them off, and although the horses' heads were within a foot of their hole they kept at work, and finally laid their eggs and brought forth the young in good order. By the aid of a mirror I threw the light into the hole, so that I could see all that was going on. They began work April 27, carried in nesting material May 10, began setting May 17, hatched May 26, and the young flew June 12. What I notice in this as singular is the fact that we usually find these birds breeding in the thickest of swamps, and almost always in white birch stumps; and that they should come into the open and so close to the house; and more, they worked most systematically, each working and taking out chips. One would carry away the chip that he (or she) had pecked out, and fly to a pear tree near by and "wipe" it off her bill, when the other would at once go in and go to work. They did it so regularly that, as one went out of the hole the other met it about half way between the pear and cherry tree.—*W. W. Coe, Portland, Conn., in Ornithologist.*

The Stinging Trees of Australia.

The stinging plants of Queensland, Australia belong to the natural order Urticaceæ, and represent two genera, *Urtica* and *Laportea*. Of the first named genus there are two species in Queensland, both herbaceous plants:

1. *Urtica incisa*, found chiefly on the Fitzroy River, and said by M. Thozet, of Rockhampton, to grow in great profusion.

2. *Urtica urens*, a common weed in this country—the nettle—and found in the neighborhood of dwellings in Queensland.

In the genus *Laportea*, on the other hand, there are three great stinging trees:

1. *Laportea gigas*, a large tree, often attaining a height of 100 feet or more. The wood is soft, fibrous, and juicy, and the bark smooth and ash colored. The base of the tree is supported by prominent angles or buttresses. The leaves are from 1 foot to 1 foot 6 inches long, and nearly as broad, smooth above and sprinkled with a few stinging hairs, but more or less covered with short, soft hairs underneath. It is found chiefly in South Queensland. The sting is severe, but not so bad as that of *L. moroides*.

2. *Laportea photiniphylla.*—A fine tree, from 60 to 70 feet in height, with a straight stem. The wood is soft, and the leaves are almost elliptical in shape, nearly smooth, and sprinkled with a few stinging hairs. It is found in the Moreton Bay district, and also in North Queensland. M. Thozet mentions having found it on the Fitzroy River.

3. *Laportea moroides.*—A small tree, with most virulent stinging hairs. The leaves, which are about 9 inches long, are covered with short soft hairs on both sides. The fruit is of a beautiful purple color, succulent, and densely clustered. This tree is found chiefly in the Kennedy district in North Queensland. Mr. Fitzalan, of Bowen, mentions that it is common about Port Denison and Edgecumbe Bay.

These three stinging trees, which Bentham and Von Mueller place in the genus *Laportea*, are by many botanists included under *Urtica*.

Of all the stinging plants of Queensland, *Laportea moroides* surpasses the others, both in the severity of the pain produced at the time and in the duration of its effects.

THE newest of the many European canal projects is one for uniting Cologne with Antwerp.

IMPROVEMENT IN WATCH HANDS.

This improvement in watch hands is designed to enable the wearer to see at a glance the different times of the place he is leaving and the place of destination, or to enable him with one watch to keep both standard and local time. The value to the traveling public of such a device is apparent in the facility which it affords for making connections between trains run by different times, as well as in keeping appointments between different cities.

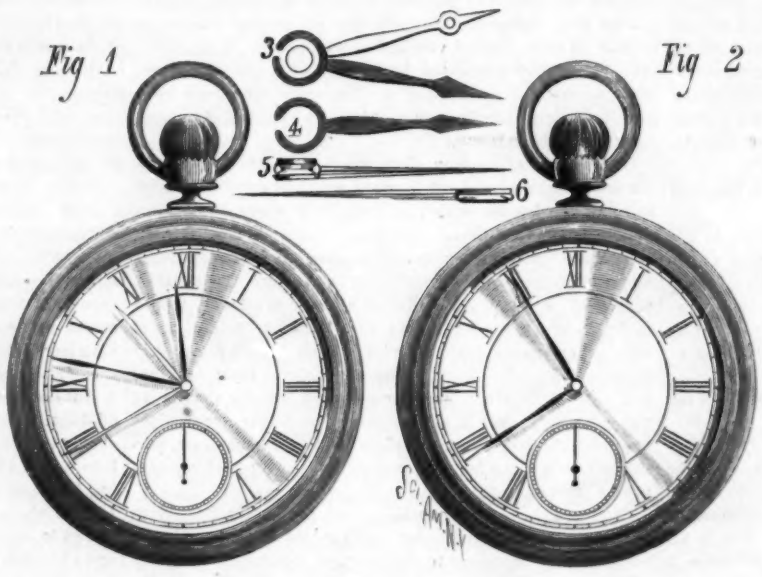
This invention provides a simple and practical device for uniting the two hands. It consists in a groove turned upon the hub of one hand, and a split spring ring formed on the other hand and sprung into the groove, and which by its elasticity preserves a constant and uniform frictional contact with the other hand, that always maintains its proper relation during the normal movement of the hands, but still permits an adjustment between them to adapt them to point to different times when it becomes necessary to adjust them to the longitude of different places.

Fig. 1 shows a watch having the auxiliary hands set for Chicago time and the usual hands set for Boston time. Fig. 2 shows the hands as they appear when only one kind of time is indicated—that is, when the auxiliary hands are pushed around behind the outer hands.

Fig. 3 is an enlarged view of a pair of hands. Fig. 4 shows one of the auxiliary hands having the spring end, and Figs. 5 and 6 are respectively side views of the hour and minute hands with the auxiliary hands applied.

This improvement will be appreciated by all travelers, and by others who are obliged to differentiate time. It is possible that this simple device may go a long way toward introducing a standard time.

This invention has recently been patented in this country, in Canada, Great Britain, France, Belgium, Germany, Spain, Italy, and Austria by Mr. John Wethered Bell, of Conowingo, Maryland.



BELL'S IMPROVEMENT IN WATCH HANDS.

IMPROVED SAW MILL.

We present a cut of the Taylor Manufacturing Company's improved plantation saw mill, a machine designed to meet the wants of parties who desire a mill to do neighborhood sawing with engines of small power, say from 8 to 18 horse power.

This mill has a solid iron girder frame of great strength, and is provided with substantial friction feed with two changes of speed. Friction feed is 3½ inches wide; feed belt, 2 inches. The mandrel has solid 8-inch bearings. This mill is so arranged that carriage can be set at either the right or left hand of the saw frame, a very essential feature where parties desire to change location. The carriage runs on a V wrought iron rail, and has two screw blocks that are made so that they can be used as a screw block, or as a ratchet block when desired. Head blocks are made heavy and substantial, and have a sliding dog in knee that is very handy to dog the last board. The knee recedes 30 inches from saw, so that the carriage may receive a large log.

This company also build the patent log beam mills in three sizes. The No. 3 mill was illustrated in the SCIENTIFIC AMERICAN of October 21, 1882. The No. 2 mill is of the same design, only heavier; and their mammoth No. 1 mill is made with or without top saw, for heaviest power and lumber. They claim for these mills very rapid work, done perfectly and accurately.

This company will remove to Chambersburg, Pa., January 1, to new and extensive works that now are nearly completed, where their facilities for turning out work will be greatly increased.

For further particulars address Taylor Manufacturing Company, Westminster, Md.; New York store, 107 Liberty Street.

Methods of Preventing Halation in Gelatine Sensitive Plates.

Halation in gelatine plates is caused by the bright light of an object passing through the gelatine film during exposure in the camera and reflecting back from the back surface of the plate against the under side of the sensitive film. Blurring effects and halos around bright objects in negatives are thus produced. It takes place more readily in thin gelatine films than in those that are thick. Several plans have been proposed to prevent halation. One of the simplest consists in smearing over with glycerine a piece of black American cloth or of mackintosh, and quickly squeegeeing the smeared side on to the back of the sensitive plate before exposure, care being taken to use a small quantity of glycerine. A rejected negative or any glass plate is sufficient to squeegee with, which is done by pressing down the cloth by pressure on the plate; the spare glycerine is thus expelled, and the air bubbles with it. After exposure in the camera, the cloth backing is easily removed from the sensitive plate and applied to successive plates.

Another method consists in flowing the back of the sensitive plate with a collodion solution made as follows: One part saturated solution of aurine in absolute alcohol with three parts of plain collodion, adding one per cent of castor oil and one per cent of a saturated solution of roseine.

Before development the collodion film must be removed. —*British Journal of Photography.*

IT will require an expenditure of at least $5,000,000 by the Italian Government to make good the damage done to roads, bridges, and public buildings by the late inundation.

Improvements in Making Glass.

The high expectations in regard to toughened glass can scarcely be said to have been realized as yet, and several improvements must still be made before the process can be considered as perfect.

The original method consisted in immersing the article while still red hot in a bath of oil heated to 200° C. (392° Fahr.), and letting it remain there until it had cooled down to that temperature. Glass hardened in this way was, indeed, hard enough, but at the same time it was very brittle, so that if put away and kept untouched it would frequently explode and fly in pieces without any visible cause.

T. Lubisch claims to have discovered a better method of hardening glass, or, rather, an improvement on the same process. He also immerses the article, while red hot, into a hot bath, but he takes it out again when it has nearly lost its redness, and lets it cool *very* slowly in an oven that is heated nearly to the temperature of the glass.

As the bath does not need to be much above 212° Fahr., he prefers to use solutions of the carbohydrates in water (starch, gum, or the like). Such a bath does not soil the surface of the glass, as is the case with fats, oils, and bituminous substances.

Glasses subjected to this operation resist pressure and shock just as well as those hardened in oil, but possess this advantage, that they can be cut with a diamond or polished and cut with sandstones.

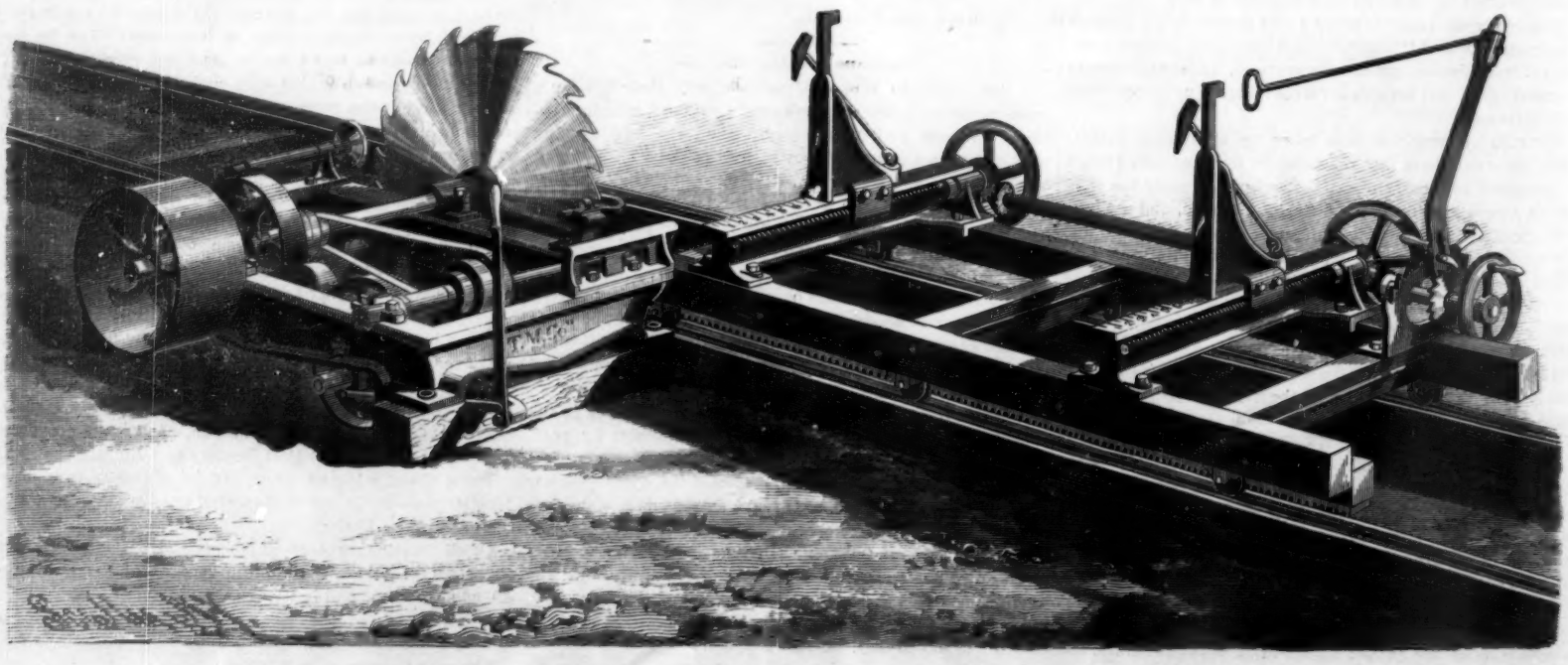
While the oil method only permits of the hardening of articles of simple shape, by Lubisch's process all glass things can be hardened, as, for example, bottles, mugs with handles, pitchers, and other vessels.—*Industrie Zeitung.*

[We have used vessels hardened by Le Bastie's process, and have observed that when broken the pieces are not smaller, as a rule, than those which would result from breaking an ordinary glass vessel, nor have we noticed anything resembling an explosion, although such explosions do sometimes occur in hard glass. —ED.]

Recent Finds in Connecticut Valley Sandstone.

Mr. Elias Nason reports, in a Boston paper, that some very fine specimens of tracks have lately been uncovered in the famous quarry at Turner's Falls, Mass. One of the slabs has on it a series of 15-inch tracks (three toed), the stride measuring five feet. Mr. Nason was permitted to take with him several beautiful specimens, one of which exhibits the delicate tracery of the feet of an insect escaping over the soft mud; another exhibits the ripples of the wave, another the drops of rain, and others have well-defined imprints of the tracks of birds. He also saw the impressions of several kinds of ferns and grasses. Mr. Stoughton, who is working this geological mine, considers some of the largest slabs to be worth from $500 to $1,000; but the cost of excavating them is heavy.

This whole region is supposed to have been originally covered by the sea. As the waves receded, birds and quadrupeds whose species are extinct left the impressions of their feet upon the mud, which, hardening into stone, has held them through the ages for the examination of the scientists of the present day. Compared with these tracks as to age, the pyramids of Egypt are but as of yesterday.



"PLANTATION SAW MILL," MADE BY THE TAYLOR MANUFACTURING COMPANY

THE GREAT HARLEQUIN BEETLE OF CAYENNE.

Among the Coleoptera which present the most singular forms may be mentioned the Longicorns, so called on account of the extraordinary length of their antennæ.

Any one who takes a walk in the oak woods on a summer evening may see the largest representative of this family in Europe flying about. It is called the Great Capricorn (*Cerambyx heros, Linn.*), and is of a brown color, almost black. The larvæ, called wood worms, bore large passages in the interior of the oaks, and often spoil the most beautiful timber. The Parisian amateurs go in search of this beautiful insect in the old oaks which border the pool of Auteuil.

Many of these oaks were cut down during the war of 1870, but there are still some in the fields which conceal the larvæ of the Longicorns in their old perforated wood.

The small Capricorn beetle (*Cerambyx cerdo, Linn.*) is black, and very much like the preceding one, but less than half the size, and lives in a larval state in apple and cherry trees. They may often be caught in July warming themselves in the sun upon the classic cherry trees of Montmorency. In very warm weather they fly at mid-day and feed, as if intoxicated, upon the odorous umbels of the leek and onion.

Walking in a warm evening under willow trees, one is often astonished by a strong perfume of rose. It is produced by the secretions of a very beautiful Longicorn of a rich metallic green, the larva of which lives in the wood of the willow. It is the *Aromia moschata*.

Often at the end of winter a Longicorn with black antennæ may be seen running along the floor of the room; it appears to be dressed in the richest red velvet. The larvæ of this blood colored beetle live in the logs of the beech tree.

The most curious European Longicorn, from the length of its antennæ, is the one called by entomologists *Astynomus ædilis*. It is from twelve to fifteen millimeters long, a little flattened, ash colored, cloudy, with yellowish hairs, and two arched irregular brownish bands upon the elytra.

The antennæ are almost three times as long as the body in the females, and about five times as long in the males.

Such appendages are very troublesome in flying. These insects may be found in April and May upon the trunks of the pine and fir, in the interior of which they have passed their larval state; they are found in the wood of all the coniferous trees.

The passage of a Longicorn from the larval to an adult state requires a very complex modification of the organs. The larvæ are whitish worms, with the thorax more or less swelled, and a form which resembles a prism with six faces.

They really possess no limbs, the small scaly legs being of no use in locomotion, the movements of the grub being performed by the contraction and extension of the ringed body. The segments are furnished above and below with strong retractile tubercles; these aid the larvæ in moving along the passages which they have bored out in the interior of the trunks of trees.

The Longicorns are also found in warm regions, as in Europe, some of them of considerable size corresponding with the enormous trees of a luxurious vegetation. The most singular kind is a large insect, which seems to be found in all tropical America, and where the exaggeration of the appendages appears not only upon the antennæ, but also upon the feet, principally the anterior ones.

The *Acrocinus longimanus*, which is shown in the engraving, has antennæ nearly twice as long as the body, black, with the base of the long joints ash colored. The corselet is black with oblique red lines. It has above near the sides two small black spines, and upon each side another very strong spine. The elytra have a spine at the base and two at the extremity; they are of an oblong form, black and silky, varied by watered spots, red, and of a greenish gray.

This variety of colors has given this insect the name of the "Great Harlequin of Cayenne," a commercial name under which it has been known for at least two centuries, in the boxes of curiosities from America sold by the merchants.

The thighs are long, sleek, and black, with a reddish ring near the joining with the leg. The anterior legs are black, furnished below with strong spines—all the others are bare, with rings of ash color. In the male the anterior thighs are the length of the body. The anterior legs, of the length of the anterior thighs, are spinous, bent back from the top, and terminate there in a strong spine on the inner side. There is less disproportion in the female.

It may be said that the larva of the *Acrocinus longimanus* is entirely different from the adult. Its legs are absolutely useless, its antennæ extremely small.

The body is divided into thirteen segments besides the head, is eighty millimeters long, with a very large overlapping prothorax, from sixteen to eighteen millimeters long, protected in the upper part by a large shield, very wrinkled and granulated. The segments of the abdomen in the middle from ten to twelve millimeters large, lengthened gradually; diminishing in size from the first to the sixth, the seventh and eighth are enlarged.

The first seven segments of the abdomen are furnished with large flattened tubercles covered with blackish granulations, and divided by creases. This larva is white, the under part yellowish, the upper shield of an obscure brown. The anterior of the head and the mandibles is black. The middle part of the head is almost smooth, the two extremities having scattered golden hairs. This larva has been found by M. Salle in Mexico, at Cordova, under the bark of a large tree of the species Ficus.

In Venezuela this same species has been observed by M. Rojas. It is said that this beetle lives in cold climates (that is to say, at a high altitude), upon the *Ficus glabrata*, from which the Coleoptera sucks the milk. The larva is found in the interior of this tree, and the perfect insect, which also inhabits it, comes out regularly in the morning to fix itself upon the Ficus, and feed upon the milk or descending sap. M. Rojas found them there, and also in their retreat, by cutting away the trunk where he saw the entrance to their dwellings, always large and opening outward.—*La Nature.*

THE GREAT HARLEQUIN BEETLE OF CAYENNE.

A California Tree.

There was recently felled in Sonoma County, California, a tree which cut up as follows. The Petaluma *Argus* says that the details can be relied upon. The standing height of the tree was 347 feet, and its diameter near the ground was 14 feet. In falling, the top was broken off 300 feet distant from the stump, and up to the point of breaking the tree was perfectly sound. From the tree saw-logs were cut of the following lengths and diameters: 1st, 14 feet long, 9 feet diameter; 2d, 12 feet long, 8 feet diameter; 3d, 12 feet long, 7 feet 7 inches diameter; 4th, 14 feet long, 7 feet 6 inches diameter; 5th, 16 feet long, 7 feet diameter; 6th, 16 feet long, 6 feet 10 inches diameter; 7th, 16 feet long, 6 feet 6 inches diameter; 8th, 16 feet long, 6 feet 4 inches diameter; 9th, 16 feet long, 6 feet 3 inches diameter; 10th, 18 feet long, 6 feet diameter; 11th, 12 feet long, 5 feet 10 inches diameter; 12th, 18 feet long, 5 feet 6 inches diameter. It will thus be seen that 180 feet of this remarkable tree was converted into saw-logs.

The Metal Cæsium.

Bunsen and Kirchhoff, when working on the method of spectral analysis, which they completed in 1860, hit upon two metals which gave lines in the spectroscope that were quite new to them. They were called rubidium and cæsium. The salts and the metal itself, in the first case, were soon prepared and studied; the second metal has only just now been obtained in a free state. It has been accomplished by Dr. Carl Setterberg, whose paper has been communicated to the Academy of Sciences at Stockholm, and the work was done at Marquart's laboratory in Bonn, where, as a by-product from the manufacture of lithia from lepidolite, the alums of these metals were to be obtained in hundreds of hundredweights. By allowing a hot concentrated solution of the alums of the two metals and of potash alum—for of these it consists—to stand, all the alum of the rare metals first separated out; the process is repeated several times, and in this way 40 kilogrammes of rubidium alum and 10 kilogrammes of cæsium alum were crystallized out. Boiling water dissolves much more of the rubidium alum than of the cæsium alum—at 0 degree 3·74 times as much, and at 80 degrees 4·08. To get the hydrates of the metals from the alum they are treated with barium hydrate, which throws down both the alumina and the sulphuric acid. This was then, in the case of the cæsium, converted into cyanide by passing perfectly dry hydrocyanic acid into a solution of the hydrate of cæsium in alcohol. It is absolutely necessary that the materials should be quite anhydrous. The reduction of the cyanide was conducted in a little clay cell, as described by Professor Bunsen in his paper on the isolation of other metals, like lithium, calcium, etc., and a mixture of four parts of cæsium cyanide with one of barium cyanide, and a current of the intensity 25, expressed in absolute measure, employed. The actual reduction of the metal from the cyanide was effected at Heidelberg in the laboratory of Professor Bunsen; and here it was that the long desired view of the curious metal was first obtained. The metal closely resembles the other alkaline metals in appearance; it is silver white in color, can be drawn out, and at ordinary temperatures is very soft. It may be stated here that Professor Bunsen told the writer of these lines some fifteen years ago that he expected cæsium would be, like mercury, a liquid metal; for in this group of metals the temperature of fusion falls as the atomic weight increases. Though not liquid, it melts at a low temperature, between 26 degrees and 27 degrees Cent.—at about 26·5 degrees Cent. In contact with water it swims on the surface, flame being evolved, as do potassium and rubidium; when exposed to the air, it soon takes fire. Two determinations of the density of the metal showed it to be 1·88 and 1·87. All experiments made with a view to reducing the chloride were attended with difficulty, and led to the employment of the cyanide instead. A curious point in connection with the history of cæsium was the analysis by Pisani, of Paris, of a specimen of the mineral pollux from Elba, which he published in 1863. Plattner held it to be a silicate of alumina and potash, but his numbers fell short to 92·75 per cent, and finding the result inexplicable, he published it. It was afterward found that the supposed loss was due to the oxide present being, not potash but cæsia, of which it contained 34·07 per cent, and thus brought the analysis up to the 100, and made it come right. This shows the importance of setting down the results of an analysis conscientiously without making up the "loss."

Oil Bath.

In order to render silk which has been dyed black more lustrous and shining, Mr. A. Gillet recommends the use of the following bath: Two parts soda crystals are dissolved in 100 parts water, the obtained solution being of 2° B. Olive oil is added to this bath until the oil begins to remain at the top of the solution. Soap can be added. The addition of citric, tartaric, or acetic acid to this bath is not recommended, as any acid would only diminish the alkaline strength of the bath. If it is required to remove the white reflection the silk has acquired in the above bath, the silk can be washed in water containing citric, tartaric, or acetic acid.

CARE OF OFFSPRING IN ANIMALS.

BY C. F. HOLDER.

The accompanying illustration shows one of the most interesting cases of maternal care among lower animals on record. It was observed by F. L. Harvey, Esq., of the Arkansas University, at Fayetteville, Arkansas, probably for the first time in America, though such occurrences have been several times chronicled in England.

Prof. Harvey was in the field gunning, and suddenly noticing a woodcock (*Philohela minor*) rise near him and fly off laboriously, he ran after it, and distinctly saw the young one clasped and held between her feet, and watched the transportation for one hundred rods, when the mother alighted and they both probably ran off together. This certainly shows a remarkable and unsuspected amount of intelligence in the woodcock, and places it in this respect above many other birds who are ranked higher.

The peculiarity of carrying the young in one form or another is seen in many families of animals. It has been recorded that the night-hawk will carry off its eggs in its mouth, an occurrence that, though doubted, would not be more remarkable than the case of the woodcock. The king penguin carries its eggs around in a sac; moving about with it with a hopping motion peculiar to this time. This is probably true of many of the penguins; also of the albatross, that builds a nest, even then holding its egg in the curious sac that is analogous to the pouch of marsupials. In the kangaroos, the appearance of the young clinging to a nipple has often caused curious errors, many observers believing the young to have grown there; and it was my privilege to read recently a pamphlet written by some observer (?) upholding this theory. The stomach of the kangaroo is of large size and very complex, its walls being puckered up by longitudinal muscular bands into a great number of sacculi, like those of the human colon. The alimentary canal is long, and the cæcum well developed. All the species have a marsupium, or pouch, formed by a fold of the skin of the abdomen, covering the mammary glands with their four nipples. In this pouch the young are placed as soon as they are born; there their growth and development proceeds; and to it they resort temporarily for the purpose of shelter, concealment, or transport, for some time after they are able to run and jump about the ground and feed upon the same herbage which forms the nourishment of the parent. During the early period of their sojourn in the pouch, the blind, naked, helpless young creatures (which in the great kangaroos scarcely exceed an inch in length) are attached by their mouths to the nipple of the mother, and are fed by milk injected into their stomach by the contraction of the muscle covering the mammary gland. In this stage of their existence, the respiratory organs are modified much as they are permanently in the *Cetacea*, the elongated upper of the larynx projecting into the posterior nares, and so maintaining a free communication between the lungs and the external surface, independently of the mouth and gullet, thus averting all danger of suffocation while the milk is passing down the latter passage.

The opossum not only rears its young in the pouch, but they cling to the mother's back, their tails entwined about her tail, presenting a curious appearance. Among the pipe fishes, the sea-horse, etc., the males receive the young into a pouch in a very similar manner. The female deposits the eggs unimpregnated, and they are caught in the pouch of the male, where they are impregnated, also drawing nourishment from the fat that lines the pouch, and are finally born the second time, over a thousand or more regular sea-colts. Dr. Lockwood thus describes the actions of his brood immediately after birth: "The scene that followed was one of singular and lively interest. I was nervous with delight, and wished that every naturalist could see it for himself. I am sure there is no student of nature but will excuse the enthusiasm which prompted me to write at once to a friend 'that he must not set the minister down as a horse jockey on being informed that he was now the proud possessor of the most numerous drove of colts ever owned by one man the whole wide world over.' Using my best judgment, for, owing to the mazy motion of this tiny throng, counting was out of the question, I set the number down as not far from a thousand. Each measured from five to six lines in length. Very minute creatures truly, when one considers how large a proportion is taken up by the tail, which organ was of but little more than thread-like dimensions. We might suppose that it would require a few days for young hippo to find out the remarkable monkey-like endowment of its tail. Not so. Only look at what my own eyes beheld many a time when a stampede of these little colts was going on, although they were but one day old. There came two little hippos, each swimming in a direction at right angles to that of the other. Just at the point of passing, one, lasso-like, whips his caudal extremity round that of his fellow, who, of course, in like manner returns the compliment, which, to speak technically, acts as a "double lock." Of course, both pull, and, by a natural law, the force is exerted in exactly opposite directions, and the right angle is resolved into a straight line. It is but poor headway they make, nor does it mend the matter much that a third little fellow comes giddily on, and switching his tail, takes a hitch in that precise point in space where the two others meet. Now a triple force is exerted, and the effect is, with two straight lines, to project three obtuse angles. And so the three toil on, obtusely laboring *in statu quo*. But a droller sight is that of yonder juvenile lophobranch, who seems to be of somewhat belligerent proclivities, as he is leading by the nose a weaker member of his own species, having, with his caudal extremity, noosed him on the snout. These funny antics, though oft repeated, are of short duration, as the parties soon have to rest from sheer fatigue."

The lamented Agassiz discovered among the South American fishes some remarkable instances of affection for their young; they were in some cases endowed with certain modifications of structure that enable them to conceal their young or eggs about their bodies. Prof. Agassiz thus refers to his discovery in a letter to the Emperor of Brazil:

"TEFFÉ.

"Sire: On arriving here this morning, I had the most agreeable and unexpected surprise. The first fish brought to me was the acara, which your Majesty kindly permitted me to dedicate to you; and by an unlooked for good fortune it was the breeding season, and it had its mouth full of little young ones in the process of development. Here, then, is the most incredible fact in embryology fully confirmed, and it remains for me only to study, in detail and at leisure, all the changes which the young undergo up to the moment when they leave their singular nest. . . ."

An Indian species of arius has a similar habit, while another of the same genus, found at Panama, has a fold in the skin in which the females carry their eggs. When hatched, they are received into the mouth of the male, and the remarkable sight is seen of young moving in and out of the capacious mouth, fleeing to it in time of danger.

Those familiar with the gigantic studis of South America aver that it has a similar habit of protecting its young.

Perhaps the most remarkable instance among the catfishes is that of the aspredo. During the breeding season, curious horny stalked capsules appear upon the ventral surface and fins; to these the eggs become attached, and the fish moves off, her coming progeny dangling and swimming after her. When the young are hatched, these cradles disappear.

Some of the tree-toads—the hylodes of the island of Guadeloupe—bear their young about clinging to their backs, and in Martinique the tadpoles (*Hylodes martinicensis*) are carried about in the same way. The female of *Notorema* has a sac upon the back in which the young are carried, and similar methods are seen in notodelphys. The most remarkable case, however, is that of the Surinam toad.

WOODCOCK CARRYING HER YOUNG.

The ant eater carries her young upon her back, a sketch of which has been shown in a former number of the SCIENTIFIC AMERICAN, and this is equally true of a number of animals, not including the monkeys.

Among insects, love of offspring seems to be predominant, and the most elaborate structures are formed for their protection. Who has not watched the jealous care of the ants over their presumable offspring! If the nest is destroyed, each ant will be seen carrying off one or more of the curiously colored young to a place of safety.

Some spiders carry their young about with them; and the scorpions, some of which are a foot long, have been seen covered with their minute young, and a popular belief exists that the mother dies a victim to their hunger. Goss gives a curious account of the care a scolopendra shows over her young: "Under a stone by the roadside at Sabito Bottom I found a centipede performing the duties of a mother. It was a blue species, about three inches in length; it was lying in the form of a bow, the head and the tail curved forward toward each other, almost on its back, the curved body embracing some ten or fifteen eggs, which slightly cohered. The parent on being disturbed darted away among the stones, leaving the eggs, so that I did not capture her. I brought home the eggs, and, having taken out a few for preservation, placed the rest carefully on moist earth in a phial, hoping to rear them. They soon, however, became covered with mould, and decomposition destroyed them. The mother's care is perhaps indispensable, as in the case of ants, regulating the admission of heat and moisture to them according to circumstances.

Antiseptic Properties of Carbonic Acid.

BY PROF. H. KOLBE.

Since 1874, when the author published his first experiments on the antiseptic action of salicylic acid, it has been his constant endeavor to find out a suitable method of its employment for preserving meat. Innumerable experiments, repeated under varied conditions, have convinced me that although meat impregnated with carbonic acid is, in fact, protected from decay, it acquires an unpleasant flavor after a few days, and when boiled or roasted it disseminates a disagreeable (but not putrid) odor. In spots where any decomposition was noticed, the meat no longer reacted acid, but alkaline.

This experience led to the conjecture that meat could be protected from spoiling by the acids in general, as well as by their gases, if it is thereby protected from the liberation of ammonia which accompanies decomposition, in the same manner as by putting it in vinegar.

The first experiment in this direction, made by putting a piece of beef on a plate under a glass bell jar of carbonic acid, was unsatisfactory. Before the end of the week, a putrid odor was perceptible, and the parts in contact with the plate, where no carbonic acid could reach them, showed an alkaline reaction.

The results were better when the meat was suspended so as to hang freely in a vessel filled with carbonic acid.

The experiment was repeated in apparatus of various sizes. The meat to be preserved was hung on a tinned iron hook that moved along a horizontal iron rod in a cylinder made of sheet tin. On the bottom of the cylinder was a porcelain dish to catch the dropping liquid from the meat, and in the side of the cylinder, just above the dish, a tubulus is soldered on air-tight, and through it passes a short glass tube connected with a rubber tube for introducing the carbonic acid gas. The rubber tube can be closed quickly and tightly by means of a pinch-cock. The cylinder also has a gutter around the top into which the lid sits, and which is half full of glycerine. A tubulus is also soldered into the top of the metallic cover, and provided with a glass tube like the lower one.

The glycerine acts like a water seal, and when the vessel is closed, carbonic acid from a Kipp's constant apparatus is passed in by the lower tubulus and expels the air through the upper one, which is left open. When nearly all the air may be supposed to have been displaced by carbonic acid, the two rubber tubes are securely clamped.

The first series of experiments were made in winter, the second in the hot months of summer. The cylinder containing the meat stood in the warmest room of my laboratory, which, being on the south side, was exposed to the sun's rays for the greater part of the day, and at noon the temperature rose to 32° C. (90° Fahr.). Pieces of freshly killed beef weighing from two to five kilos (4½ to 11 lb.), including bone and fat, were used.

A week after the beef had been put in the cylinder of carbonic acid, it could not be distinguished by appearance, color, or odor from fresh meat. It reacted slightly but distinctly acid everywhere.

After being carefully washed off it was boiled in water. The broth made from it smelled and tasted just like that from fresh meat, and the meat itself, if not boiled too long, was soft and tender, not stringy.

Meat suspended in carbonic acid for two weeks had the same qualities as the other, except that it looked grayer, but within it was red and juicy. The broth made from it, as well as the meat itself, had a pleasant flavor, and only a very sensitive palate could distinguish a slight difference in the taste of this broth and that from fresh meat. In a few cases the meat as well as the soup had a slightly acid taste, which was completely removed by putting in a very small quantity of carbonate of potash. Meat kept in carbonic acid for three weeks was as good as that left there for two weeks, but was softer than fresh meat, and required less time to cook it, or to obtain good broth.

After being kept in carbonic acid for four or five weeks, the meat was still free from putrid smells, but the broth made from it did not taste as good as fresh *bouillon*. The experiments were not continued any longer.

From this it will be seen that *carbonic acid is an excellent preservative for beef*, in which it will retain its flavor for several weeks.

It is worthy of note that mutton acts quite differently, and after being kept in carbonic acid gas for a week it begins to have a putrid smell.

Veal does not keep as long as beef. No experiments have been made with game or fowls.

Fish, oysters, and fruit only keep a short time.

This property of carbonic acid to preserve beef a long time will scarcely become of any great practical importance, but may find use where carbonic acid is given out in abundance from the earth. At the Nauheim baths there are dry wells in which almost unlimited quantities of carbonic acid stream forth and are pumped out to be used for making soda water, and for other purposes. It would be worth while to try how long beef could be kept fresh by hanging it on a rope in such a well.

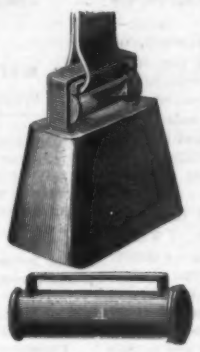
The experiments described give rise to many other queries, such as whether light has any effect on the preservative power of carbonic acid.

The author does not propose to extend his experiments any further, and leaves the field free for others who wish to study the chemical and physiological changes and reactions.
—*Chemiker Zeitung.*

RECENT INVENTIONS.

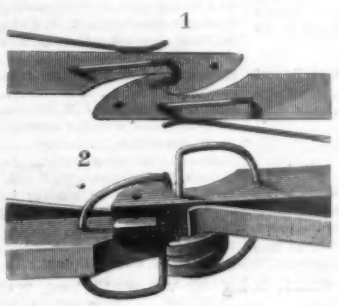
Novel Animal Tag.

This is a new tag for animals, consisting of a tube provided with a removable cover and an elongated staple for the strap by which the tube is held to the animal. A tube or lengthened box or casing, A, preferably made of metal, is closed at one end, and at the opposite end is provided with a hinged cover, which can be secured and locked on the tube by means of a spring tongue or any other suitable device. The tube, A, is provided with an elongated staple, through which a strap can be passed to secure the tube on the animal's neck. If desired, the tube, A, can be held within the staple of a bell, as shown in the engraving, the bell-strap passing through the staple of the tube, A, and through the staple of the bell. Papers or documents bearing the name of the owner of the cattle, or other information in relation to the animal, are placed in the tube or casing, A, which is then closed. The tube is to be made very small, so that it will not molest the animal. This invention has been patented by Mr. Elias G. Queen, of Big Valley, Tex.



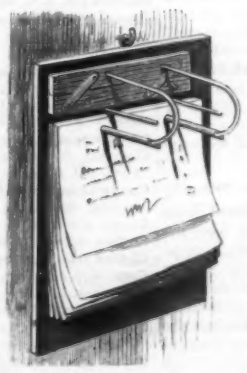
Improved Car Coupling.

This invention consists in the combination, with a drawhead having a hook formed at its end, of a spring which presses the drawhead in the direction toward the open side of the hook, and of loop frames formed on the top and bottom of the drawhead, whereby two such drawheads can catch on each other or on the loop frames, accordingly as the drawheads are at the same or different elevations above the track. The operation is as follows: When the drawheads come together, the beveled ends strike against each other and are moved laterally from each other. When the ends of the short prongs of the hooks have passed each other, the drawheads snap toward each other, and the hooks catch and engage as shown in Fig. 1. When the drawheads are at different elevations above the tracks, the hooks catch on the frames projecting from the tops and bottoms of the drawheads as shown in Fig. 2. This invention has been patented by Messrs. Geiger & Lynn, of Norristown, Pa.



Improved Letter File.

The letter file shown in the engraving is so constructed that the curved locking pins will be out of the way when letters and other papers are placed on the file. Two tubes, having their upper ends beveled to form points, project upward from a board, and between the tubes and the nearest transverse edge of the board two thin rods or wires project upward, the wires being about the same height as the tubes. Two curved wires or rods project upward from a strip which rests on the board, and is connected by means of two pivoted links with a similar strip fixed on the board parallel with the transverse edge. The strip carrying the curved wires can be moved upward from the fixed strip. The curved wires are so arranged and of such size that when the movable strip rests against the fixed strip the upper ends of the curved wires will pass into the upper ends of the tubes. By pushing against one end of the movable strip the curved wires will be moved from the ends of the tubes, and the sheets to be filed can be placed on the board, the tubes passing through the sheets. The straight wires form guides, against which the edges of the sheets are rested, so that all the sheets will be pierced by the tubes a like distance from the edge. When the file is closed, no paper or sheets can be removed from or placed on tubes. This invention has been patented by Mr. Morris Herzberg, of West Point, Ga.

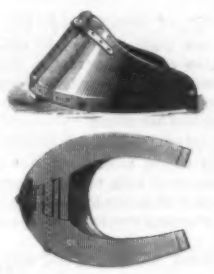


Pillow-sham Holder.

The annexed engraving shows an adjustable extension frame, by means of which pillow-shams may be made to retain the smooth and neat appearance they present when coming from the hands of the laundress. The invention consists in the novel construction and arrangement of bars, made of wire or other suitable material, having looped and hooked ends or bowed ends lapping past each other and secured adjustably in clips, thus forming a rectangular frame easily adjustable as to length and width. By this construction the supporter may be adjusted for any size pillow-sham desired. This useful device has been patented by Mrs. Mary A. Steers. Further information may be obtained by addressing Mr. George Steers, 427 North West Street, Kalamazoo, Mich.

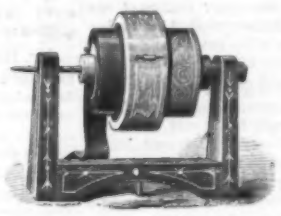
Novel Horseshoe.

This horseshoe has a base made in two parts, hinged together at their forward ends, and having a cap, also made in two parts, attached to the base, the parts of the cap being provided at their upper forward corners with eyes and a fastening staple, and the hinged parts of the base being locked in place by a screw-rod passing through the hinged end of the base, whereby the shoe can be readily applied and detached, and will be securely held in place while in use. With this construction the shoe can be easily and quickly applied to and detached from a horse's foot by removing the screw-rod and fastening, and when applied to the foot will be held firmly in place by the screw-rod and fastening. This shoe has the further advantage of protecting the hoof and preventing the hoof from spreading or cracking. Fig. 1 is a perspective view of the shoe, and Fig. 2 shows the bottom. This invention has been patented by Mr. George W. Fenley, Sr., of Tolosa, Tex.



New Ribbon Reel.

The engraving shows a new reel or frame for holding rolls of ribbons in such a manner that they can be exhibited to great advantage, and can easily be unwound when parts are to be cut off. The shaft or rod is supported in the standards having notches in their upper ends to receive it. The shaft has washers and a binding screw for holding the rolls of ribbon in place. Any desired number of ribbon rolls are passed on the shaft. By means of a screw, the base of the reel can be secured in a show window. When the ribbons on the reel or frame are in the window, they can be examined conveniently by buyers, and will be exhibited to great advantage without becoming mixed with other articles. One or more of the ribbons may be unwound and drawn into the store, when the desired length can be cut off conveniently. The remaining part may be wound on the roll, and secured by means of a pin. This invention has been patented by Mr. Allen T. Cook, of Morven, Ga.



The Swiss Watch Trade.

The Geneva correspondent of the London *Times* writes:

According to the annual report of the Swiss *Handels und Industrie Verein*, the Swiss watch trade during the last thirty years has undergone some notable changes. The more general use of machinery, the establishment of factories, and the introduction of improved methods of manufacture have cheapened production and led to a great extension of business. In these factories, watches, with some trifling exceptions, are made from beginning to end, as they are made in the large American watch factories. It is nevertheless not the case, as is sometimes asserted, that Americans were the first to make watches by machinery. A firm at Geneva, Vacheron & Constantin, had a factory and turned out watches by machinery before a single watch was made in the United States, and the Americans procured their first watch-making machinery from Switzerland.

But Geneva has lost its ancient supremacy in watch making. Fine watches (*montres soignées*) are put together and regulated here, but the greatest market in the country, probably in Europe, is Chaux-de-Fonds, in canton Neuchatel. The factory system is being largely adopted in the newer watch making districts, such as the Bernese, Jura, and the town of Bienne. The latter place is fast becoming a sort of horological Sheffield. Many Geneva houses have found it expedient to establish *comptoirs* there, and a trade of which Geneva had once the monopoly—the making of watch cases—has gone altogether to Bienne.

The movements of complicated watches—chronographs, repeaters, and perpetual calendars—are still made exclusively in the valley of Lake Joux, and no place, in or out of Switzerland, shows any disposition to dispute the supremacy of the mountaineers of the Vaudois Jura in this, the highest branch of horologic art. The report from which I quote observes that one of the results of the extension of mechanical watchmaking has been to deprive Switzerland of the practical monopoly in the production of time keepers which she once enjoyed. She has now several foreign competitors. American competitors, albeit their pretensions are as lacking in modesty as their goods in quality, are regarded as the most formidable—in America. This competition has, however, its favorable side, for during the last two years American watchmakers have procured many of their movements and their most tastefully executed cases in Switzerland. English and German competition, especially German, are mentioned with something like contempt.

Swiss watches, owing to improved methods of manufacture, are now higher in quality and lower than ever, and, say the authors of the report, the best and cheapest in the world. Many foreign watchmakers resort to Switzerland for their supplies, and hundreds of watches sold abroad as "home-made" are made in this country. The calamitous crisis which followed the over-production of 1874 and previous years is now at an end, and, thanks chiefly to the American demand, the Swiss watch trade is fairly active. England and France (notwithstanding the rivalry of Besancon) are good customers; the demand from Germany, Austria, and Russia (which take mostly watches of inferior quality) is not so good as could be wished, but the trade with Spain, Portugal, Italy, and the East shows decided signs of improvement. Prices have not, however, increased in proportion to the increased demand, and there is reason to fear that production is again outrunning consumption. Wages, too, are showing a tendency to rise; in several departments an advance has been already conceded, and altogether the position and prospects of manufacturers are much less satisfactory than might be desired.

Another Great Lake in Africa.

The existence of another equatorial lake in Central Africa, far to the west of Albert Nyanza, rumors of which have reached Europe from time to time since Sir Samuel Baker's first journey, is again reported, this time in a much more definite form. Mr. F. Lupton, Governor of the Egyptian province of Bahr el Ghazal, writes to the London *Times* from his station, Dehm Siber, on the 27th of July, to the effect that Rafai Aga, an employe under his command, on his return from an expedition toward the Uelle, told him that he and some of the members of the expedition had seen a great lake in the country of the Barboa, a powerful copper-colored tribe clothed with a peculiar grass cloth (of which Mr. Lupton sends a specimen in his letter). Mr. Lupton gathered that the position of the lake was in about 3 degrees 40 minutes north latitude and 28 degrees east longitude, and that it was quite as large as Victoria Nyanza. When the weather permits, the Barboas cross the lake in large open boats made out of a single tree, the voyage taking three days, and they obtain from the people living on the western side (their own country being east of the lake) articles of European manufacture, such as blue beads and brass wire. Mr. Lupton adds Rafai Aga's own account of his route to the lake: Started from Dehm Bekeer, marched six days southwest to Zeriba el Douleb, then four days south-southwest to Bengier; four days southwest to Zeriba Warendema; six days southwest by west to the Bahr el Makwar, which he crossed after visiting several very large islands inhabited by a people who call themselves Basango. The Makwar is called by the Arabs Bahr el Warshal, and joins the Uelle, but is a much larger stream; both flow in a west-southwest direction. After crossing the Makwar, Rafai marched ten days south-southwest and reached the residence of the Sultan of Barboa, by whom he was well received; the lake is situated four days' march to the southwest of the Sultan's residence. Mr. Lupton concludes by saying: "I feel I should not be doing right in keeping dark this information, which, when looked into by competent persons, may throw some light on the famous Congo and Uelle rivers. I believe that the Uelle flows into the lake discovered by Rafai Aga, and that the stream which is said to flow out of the lake probably joins the Congo." Mr. Lupton further informs the *Times* that he is engaged in preparing a map of this province, and that he was about to start in a few days on a journey to a country called Umbungu, some fifteen days' march to the west of Dehm Siber.

The Voltaic Arc.

At a recent meeting of the London Physical Society, Prof. S. P. Thompson read some "Historical Notes on Physics," in which he showed that the voltaic arc between carbon points was produced by a Mr. Etienne Gaspar Robertson (whose name indicates a Scotch origin), at Paris, in 1802. This reference is found in the *Journal de Paris* for that year. Laboratory notebooks at the Royal Institution, however, are said to show that Davy experimented with the arc quite as early. The experiment usually attributed to Franklin, of exhausting air from a vessel of water "off the boil," and causing it to boil afresh, is found in Boyle's "new experiments touching the spring of the air."

ENGINEERING INVENTIONS.

Mr. Frederick H. Rudd, of Hebron, Neb., has patented a self-acting contrivance for lifting the car coupling pin to allow the link to enter the drawhead and dropping it into the link after it has entered; also an improved arrangement for setting the pin so as not to couple when desired.

Mr. James Clement, of Grand Forks, Dakota Ter., has patented an improved elevator or carrier, for raising the earth from the plow by which it is dug in the ditch up to the chute by which it is discharged upon the bank at the side of the ditch, the object being to contrive an endless carrier that will not be clogged by the earth, but will keep free and run easily.

Mr. Leffert L. Buck, of New York city, has patented a machine which may be adapted to be used as a pump, a water motor, or a water meter. The invention consists in the combination of a screw of peculiar form with a wheel whose wings work in the threads of the screw, all of the working parts being inclosed in a metallic casing having suitable induction and eduction orifices for the reception and discharge of the water or other liquid.

Messrs. Thomas A. Cullinan and Augustus W. Baldwin, of Junction City, Kan., have patented a car coupling constructed with a drawhead, a hinged coupling pin, a hinging cross pin having a crank arm upon its end, a chain attached to the crank arm, a rod having crank arms for raising the coupling pin and locking it when raised, a guard to protect the hinging cross pin, and a cap plate to prevent rain and sleet from entering the drawhead.

An improved tie bar for railroad rails has been patented by Mr. E. Daniel Samain, of Pierceville, Kan. The invention consists in a bar having its ends bent over the outer edges of the bases of the rails, combined with a plate attached to the under side of the bar, and provided with upwardly inclined prongs or clips overlapping the inner edges of the bases of the rails, whereby the rails will be held firmly on the bar. The plate is held on the bar by means of a bolt in such a manner that the upper surfaces of the prongs or clips rest against beveled shoulders on the bar a short distance from the inner edges of the rails.

MECHANICAL INVENTIONS.

An improved combined cotton press and gin power has been patented by Mr. Edward Franklin, of Thomasville, Ga. This invention consists of attachments to a horse power cotton press, whereby the same power may also be utilized for driving the gin and other machinery.

Mr. Isaac F. Bissell, of Brooklyn, N. Y., has patented an improved car axle box consisting in a follower for applying lubricants to journals, made in two parts, hinged together at their adjacent edges, and provided with a fastening and separate springs, whereby the follower can be inserted in a journal box while the journal is in place.

An improved peg cutter has been patented by Mr William B. Stringfield, of Pineville, Mo. The improvement consists in the construction of parts for attaching the peg cutter proper to a carrier or plate, for securing the cutter at any required angle, and for limiting the vertical movement of the bar to which the cutter is attached.

An improved carpenter's square has been patented by Mr. W. H. Callihan, of Galveston, Texas. The square is intended to be plated with nickel or similar metal; and the invention has for its object such construction of the square that the plated surfaces will be protected from wear, and the square made stronger and better than those in common use.

An improved straw conveyer belt has been patented by Mr. Alton J. Park, Jr., of Virginia, Mo. The invention consists in the combination, with a conveyer belt and the cross slats, of strips of leather secured on the belt in advance of the slats at the ends and overlapping the slats for preventing straw from passing between the slats and the belt.

An improved lock strike has been patented by Mr. James Hoover, of Gratis, O. This invention consists in a novel arrangement of a box or keeper, and a spring lever. This invention lessens the friction of the latch bolt in closing a door, as the bolt is not forced back, as in the old style of keepers. This improvement is adapted for use with ordinary door locks.

An improved machine for bending lock plates has been patented by Messrs. Thomas Donahue and William W. Cone, of Terryville, Conn. The object of this invention is to produce lock plates and caps more accurately and more cheaply than has heretofore been done. It relates particularly to feed devices which are combined with such machines for automatically feeding the plates. The feed devices consist of a funnel in which the plates are stacked and a reciprocating feeder that carries the plates one by one to the bending die. The punch and die are constructed to bend the plates and cut the pin and cheek holes at the same time, and the finished plate is displaced by the next one brought beneath the dies.

AGRICULTURAL INVENTIONS.

An improved garden tool has been patented by Mr. Joseph J. Swain, of Montevallo, Ala. This invention consists of an improved contrivance of the handle socket and the shank of a hoe or other tool for a ready and simple means of detachably connecting them together, so that one handle may serve for a whole set of hoes, weeders, rakes, and other forms of hand tools employed in garden work.

Mr. Seth Bottomley, of Nashville Center, Minn., has patented an automatic straw stacker having an upright shaft journaled in an extension of a separator top, and having hinged to its lower end a frame provided with pulleys carrying endless toothed belts. The upright swiveled shaft has a ratchet wheel attached to it, and is operated by a double pawl placed upon a vibrating lever, and is reversed by pins attached adjustably to the ratchet wheel. The toothed belts of the stacker are driven by gear wheels and pulleys and bands from the driving mechanism of the separator.

An improvement in churns has been patented by Mr. James Reesman, of Agency, Ia. This invention is based on the discovery that cream may be rapidly converted into butter by causing it to be forced through and discharged from suitable pipes or passages arranged in the churn. In carrying this invention into effect a double acting force pump is provided, which forces the cream from the main body of the churn through the piston wells of the pump, thence through suitable passages and pipes which discharge the cream back into the body of the churn, the circulation of the cream being thus made continuous and caused to pass through the pipes or passages over and over again.

MISCELLANEOUS INVENTIONS.

Mr. Wilhelm Reissig, of Darmstadt, Germany, has patented an improved printing ink consisting of black or dioxide of manganese and linseed oil varnish.

Mr. Joseph W. Congdon, of Paterson, N. J., has patented a garment that may be worn either as an outer or an inner garment and as a shirt, frock, coat, jacket, blouse, or a waistcoat, as occasion may require.

Mr. William K. Rairigh, of St. Petersburg, Pa., has patented an improved trace hook. The hook is cast with the recess filled with rubber packing, by which the hook is made noiseless.

Mr. Benjamin Wilson, of Keyport, N. J., has patented a composition for polishing metals, consisting of potter's clay, four pounds; soot from hard coal, two pounds; oxide of iron, one pound; chalk, one pound.

Mr. Henry D. Merrill, of Springfield, Ill., has patented a fence for low lands liable to be submerged by high water, so constructed that it will swing down in either direction when struck by rubbish floating upon the water, and will again rise into an upright position when the rubbish has passed.

Mr. Charles E. Seabury, of Stony Brook, N. Y., has patented a fire escape constructed with a shaft, a flexible ladder connected with the shaft, guy ropes connected with the flexible ladder by brace ropes to steady the ladder, and a hauling rope for drawing out the ladder.

Mr. Charles S. Barnard, of New York city, has patented an improved draw handle which consists of a spun or sheet metal cap for receiving the ends of the ring or pull, into which cap a stem or pin is placed, and is secured therein by pouring molten metal into the cap.

Mr. James H. Baxter, of Portland, Me., has patented a package of boneless fish pressed into a solid mass of uniform size throughout its length and incased in a wrapper which is marked into equal divisions indicating where the package may be cut across to separate it into multiples of the whole package, as one-half, one-third, one-fourth, etc.

Mr. Francis G. Powers, of Champaign, Ill., has patented a die or mould for forming elastic corn and bunion pads, consisting of a metal core having the circular rounded lateral projection formed solid therewith, in combination with the metal dies having a central cavity adapted to receive such projection, but fitting closely to the end portions of the core.

Mr. John H. Solis, of New York city, has patented an improved close fitting cock of simple construction. The invention consists in the employment of a cock casing having in the upper surface of one side a longitudinal groove, a rack or toothed bar having a valve and shoulder sliding in the groove, and a spindle provided with teeth gearing with a rack.

An improved fence and gate post has been patented by Mr. Arthur O. Barnes, of Moore Park, Mich. The invention consists in a post for fences and gates, having a foot moulded of cement and sand, with a conical lower end, and having an interior screw collar or sleeve, with which is connected the lower end of a post provided with an ornamental head, and having a collar to rest upon the upper end of the foot.

Mr. James H. Barrett, of El Dorado, Ill., has patented an improved contrivance by which the evener may be tripped by the driver, and turned by the horses, so that the traces will detach and allow the carriage to be disconnected from the horses when they become uncontrollable, the arrangement by which this is accomplished being very simple, cheap, and effective.

Mr. Francis M. Hazleton, of Red Bluff, Cal., has patented an improved car coupling. The drawhead has a sliding block actuated by a spring for holding up the coupling pin when uncoupled and pressing against the link and pin when coupled, a sliding bar, levers, and connections for raising and lowering the coupling pin, and a pair of springs for pressing laterally against the link to hold it in position.

A table which may folded into small compass, for convenience in transportation, moving, and stowing away, has been patented by Mr. Charles D. Blakeslee, of Grand Rapids, Mich. The invention relates to the construction and arrangement of parts, whereby the hinged braces of the folding legs are held in place both when the legs are extended and folded, and whereby the folding side leaves are supported when extended.

Mr. William B. Farrar, of Greensborough, N. C., has patented an attachment to a bed, couch, or berth which serves as a brace or stay to the body of the sleeper, to prevent involuntary rolling in bed, such as is caused by the lateral pitching of a sleeping car, the rolling of a ship, or even the involuntary movement of a sleeper in an ordinary bed, when it may be desirable, by reason of a wound or other cause, to prevent the individual from turning over.

A device for effectually securing, sealing, and labeling bags and other receptacles generally, but more especially intended for use on mail bags containing mail matter, specie bags containing specie, and other receptacles for private or valuable matter, has been patented by Mr. Thomas A. Platt, of Brooklyn, N. Y. The device consists of the cup and the frame, the cup being slotted for the passage of a strap and the frame provided with a staple or loop.

An improved electrode for batteries has been patented by Mr. James Pitkin, of Clerkenwell, County of Middlesex, England. This invention relates to improvements in the construction of secondary batteries, but it is also applicable to primary batteries. It consists in an improved construction of holder or frame to contain turnings or other shreds of lead of which the electrode is made, without the use of any inclosing fabric.

Mr. Charles Knopp and Joseph Knopp, of Winona, Minn., have patented an improved carrycomb consisting of a series of coils of spring wire placed side by side on a back of any kind, and intercoiled with each other and attached to the back at the ends of the coils, so that the numerous oval projections of the coils form excellent and very efficient teeth for currying animals, the teeth being not only harmless but agreeable to the animals.

An improved bottle label holder has been patented by Mr. William Wallace Quiggle, of Winnebago City, Minn. The invention consists in the combination, with a bottle provided with horizontal segmental grooved flanges, of a glass or porcelain label having its top and bottom edges passed into the grooves of the flanges, between which label and the bottle a wedge or strip is inserted to hold the label in place and prevent it from sliding or slipping out from between the grooved flanges.

An improved furnace grate has been patented by Mr. Frederick Shriver, of Grand Rapids, Mich. The invention consists of an improvement in the form of the grate bar, calculated to enable the bar to resist the tendency of the heat to spring and bend it more effectually. It also consists of improvements in the construction of the points or projections of the sides of the bars, designed to facilitate the discharge of the ashes and other matters by the rocking of the grates and without the use of the poker.

An improved thill loop for harness has been patented by Mr. William K. Rairigh, of St. Petersburg, Pa. This is an improvement in that class of thill loops for harness having a metal bushing or block provided with a frictional roll, to reduce friction between the thill and the bushing or block; and it consists in providing the block or bushing with continuous flanges projecting beyond its sides, and with a pin or projection at its lower end, the flanges having loops formed integral with themselves upon their side edges at the upper ends.

Mr. Hans J. Müller, of New York city, has patented a dynamo electric machine constructed with two sets of field magnets, which are united and combined in such a manner as to form two double outer poles, and four independent inner poles, between which poles the armature rotates, the armature coils being overlapped by the projecting ends of the magnet cores. The coils of the magnets can be united in such a manner that the polarity of the double pole and the corresponding inner poles will be alike or opposite, as may be necessary, according to the kind of armature used.

An improved filter has been patented by Mr. John N. Stevens, of Toledo, O. This improvement is designed to facilitate the settling of the matters contained in the water into a mud space before the water enters the filtering material; also, to facilitate the cleaning of the mud drum and the filtering material at the same time by causing water to flow back through the filtering material from the clear water pan into the mud space under the filtering material, and thence directly out through a discharge passage in a manner calculated to efficiently cleanse the filter.

Mr. Henry Coker, of Indianapolis, Ind., has patented an improvement in conveyers used in buildings for storing grain for conveying grain in bulk or large quantities from one part of the building to another, which consists in a novel construction of parts, whereby a more perfect dump hole than is usual with other trough and flight conveyers is obtained, the flights move with more perfect freedom through the trough, and are prevented from carrying grain over the dump hold or its edges, and the links of the chain by which the flights are carried and moved are prevented from holding grain while passing over the dump hole.

A novel book holder and arm rest combined has been patented by Mr. John J. Armstrong, Jr., of Brooklyn, N. Y. The principal object of this invention is to provide a device for book-keepers' use for holding the journal or day book open and in convenient position for posting therefrom. Another object of the invention is such construction of the book holder that it is adapted to receive and hold the ordinary book keeper's arm rest, so that the two may be united and sold as one article. The device consists of a board provided with a hinged book rest on one side and a sliding arm rest on the other, the one folding down flat and the other sliding in ways close to the board.

Mr. Alexander C. Landry, of New Orleans, La., has patented a novel filter press, designed more particularly for separating the sirup or juice from the solid residuum in the manufacture of glucose and grape sugar, but applicable also for other purposes, such as oil refining, etc. It is an improvement upon that form of filter press in which a set of separable rectangular frames are clamped together in marginal contact, and are provided with filtering partitions having a central hole that permits the mash to distribute itself through the entire series of chambers formed by the frames, which chambers retain the solid residuum, while the juices pass under pressure through openings in the partitions and are separated from the solid matters.

Mr. Allen C. Burner, of Green Bank, W. Va., has patented an improvement in cider mills which consists mainly in the combination, with a case having an elliptical or oval shaped chamber, of a horizontal revolving disk having radial sliding pistons, with the pairs of pistons which are at right angles to each other coupled or connected together for the same movement, so that when one of these pistons is resting against the wall of the chamber at the minor axis of the ellipse the other piston of the pair will be projected beyond the periphery of the disk to the major axis of the ellipse, acting to squeeze and crush the apples in the crescent shaped spaces between the periphery of the disk and the inner wall of the case.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 28, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1836, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1836; but at increased cost, as the specifications, not being printed, must be copied by hand.

Adding machine, Shattuck & Thorn, Jr. 268,135
Air, transmitting power by compressed, A. D. F. Farley 268,210
Alarm. See Burglar alarm. Elevator alarm.
Angle irons, bending, G. J. H. Goehler 268,010, 268,011
Animals, apparatus for transporting, H. C. Hicks. 268,018
Axle gauge, R. Boyce 267,995
Baling press, E. B. Cunningham 268,001
Baling press, R. W. Whitehurst 268,334
Barrel, J. H. Elward 267,982, 268,263
Bathing cabinet, folding, W. K. Jones 268,240
Battery. See Secondary battery. Stamp battery.
Bearing, anti-friction, J. G. Avery 267,991
Bed bottom, F. M. Case 268,356
Bed bottom, spring, H. Benedict 268,071
Bed, folding, A. L. & C. A. Warner 268,326
Bedstead, cabinet, J. Lowth 268,052
Bedstead, invalid, I. D. Johnson 268,238
Bedstead, sofa, R. W. Taylor 268,145
Belt shifter, F. S. Stevens 268,051
Bevel, D. A. Clarke 268,188
Billiard cue, C. J. Wiley 268,065
Block. See Brake block. Pulley block.
Board. See Washboard.
Boiler furnace, steam, W. T. Hatch 268,008
Bolt threading machine, H. C. Brill 268,074
Bolt wedge, split, J. P. Edmonds 268,237
Boot and shoe fabric, H. E. Urann 268,330
Boot and shoe sole edges, machinery for burnishing, M. Dudley (r) 10,250
Boot and shoe soles, machine for moulding, Pope & Fox 268,134
Boot or shoe insole, J. B. Stevens 268,141
Boots or shoes, metallic counter stiffener for, A. W. Blakeslee 268,073
Boring and tenoning machine, H. J. Miller 268,118
Bottles, jars, etc., packing for, J. Lamont 268,247
Box. See Cake or cracker box. Feed box. Musical box. Packing box. Tobacco steaming box.
Box fastener, W. Lang 268,108
Brake block, U. M. Gordon 268,060
Bridge, E. B. Stephens 268,309
Broom corn press, A. Anderson 268,069
Brush, L. Stone 268,052
Brush handle, extension paint, G. W. Smith 268,301
Brush trimming machine, J. M. Pickering 268,278
Bung, J. Kirby 268,026
Burglar alarm for doors, C. A. Smith 268,300
Button, W. C. Howard 268,021
Button fastening, W. Wiggins 268,326
Buttons to materials, securing, J. Mathison 268,370
Cable, scrap metal, J. C. Milligan 268,263
Cake or cracker box, H. R. Stewart 268,311
Calculator for millers' use, Haight & Segur 268,221
Can jacket, sheet metal, Stokes & McNally 268,313
Can opener, R. B. Pumphrey 268,281
Capsule machine, Hubel & Taylor 268,103
Capsule remover, H. H. Taylor 268,144
Car, ballast, T. P. Cordrey 268,000
Car coupling, E. W. Grant 268,219
Car coupling, S. A. Hauser 268,017
Car coupling, W. McCubbin 268,258
Car coupling, T. H. Mebane 268,117
Car coupling, T. H. Pegram 268,042
Car coupling, E. & A. Taylor 268,315
Car coupling, D. Witt 268,163
Car, dumping, Shoudy, Jr., & Atherton 268,290
Cardina machines, side drawing device for, M. A. Furbush 268,365
Carpet stretcher, Williams & Braffett 268,067
Carriage, child's, G. P. Steinbach 268,139, 268,140
Carriage spring, J. Walsh 268,156
Carriage top, R. G. Britton 267,997
Carrier. See Trace carrier.
Case. See Tape line case.
Cesspool, L. Mouras 268,120
Chain, ornamental, J. J. Horton 268,102
Chair. See Opera chair. Rocking chair. Window cleaning chair.
Check row cord or wire, anchor for, T. C. Lord 268,110
Check-rower, R. C. & A. L. Jordan 268,241
Chopper. See Cotton chopper.
Churn, J. J. Kimball 268,243
Cigar packing press, C. H. Evers 268,088
Cleaner. See Cotton cleaner.
Clocks, synchronizing, L. Waldo 268,328
Clothes drier, T. D. Brown 268,076
Clothes drier, S. D. Morton 268,040
Cock, stop, J. L. Dibble 268,006
Coffee-pot, J. W. Weakley 268,061
Coin holder, G. W. Rowley 268,296
Coloring matter, C. Martius 268,113
Composing stick, extension, C. L. Divine 268,084
Cooler. See Water cooler.
Cooling apparatus, H. Kropff 268,106
Corn popper, J. Wilkie 268,337
Cornice, window, H. F. Gray (r) 10,249
Cotton chopper, H. C. Dyer 268,204
Cotton cleaner, J. E. Engram 268,209
Cotton gin rib, T. C. Garlington 268,097
Coupling. See Car coupling.
Culinary fork or domestic implement, Stearns & Holmes 268,138
Cultivator, J. J. Deal 268,356
Cultivator, Howe & Oatley 268,234
Curtain rod holder, W. J. Mullen 268,265
Cutter. See Lathe cutter. Sewing machine thread cutter. Straw cutter.
Desk, school, J. Peard 268,275
Detecter. See High steam and low water detecter.
Dock, screw, M. Bowe 268,177
Doll, G. H. Howard 268,020
Door hanger, A. Parkman 268,274
Door or window screen, R. H. Hooper 268,101

Doubling, twisting, and winding machines, stop-motion mechanism for, J. & T. A. Boyd..... 268,178
Dredging bucket, W. H. Wood..... 268,345
Drier. See Clothes drier.
Dropper. See Seed dropper.
Dry plate holder and envelope, C. H. Schofield .. 268,297
Egg preserving compound, S. L. Castor..... 268,184
Electric cable, R. S. Waring.....268,060, 268,157
Electric cable, lead armored, R. S. Waring..... 268,158
Electric cable, submarine, R. S. Waring..... 268,059
Electric cables, dividing and branching, R. S. Waring 268,324
Electric cables, uniting and branching, R. S. Waring. 268,159
Electric generator, V. W. Blanchard..... 268,174
Electric machine, dynamo, R. H. Mather..... 268,255
Electric machine, dynamo, E. Weston..... 268,331
Electric machine, dynamo or magneto, T. A. Edison 268,205
Electric storage batteries, apparatus for charging, V. W. Blanchard..... 268,175
Electric wire conduits, increasing and reducing joint for, C. Linford..... 268,081
Electrode, vaginal, A. W. Tipton..... 268,346
Elevator. See Water elevator.
Elevator, P. Hinkle..... 268,233
Elevator alarm, A. C. Jacobi..... 268,105
Elliptical springs, device for tightening the bands of, W. W. Bruce..... 268,179
Embroidering and embroidery, C. Wheeler..... 268,332
Engine. See Fire engine. Rotary engine.
Evaporator, M. Day, Jr..... 268,190
Evaporator, H. B. Stevens..... 268,310
Excavating dirt, etc., H. A. Carson..... 268,181
Extractor. See Nail extractor.
Fan combination stand, automatic, C. H. McKeehan..... 268,116
Feed box for stock, A. D. Tingley..... 268,150
Feed mill, T. C. Cadwgan..... 267,999
Feed water heater for steam boilers, W. Dunn... 268,208
Felt, manufacture of seamless, R. W. Perkins.... 268,276
Fence stand of scrap metal, J. C. Milligan..... 268,264
Fertilizer compound, W. D. Styron..... 268,314
Fifth wheel, E. Squires..... 268,306
Filter, eccentric-shaped, L. Smith 268,304
Firearm sight, F. W. Freund..... 267,990
Fire engine, L. H. Zeigler..... 268,395
Fire escape ladder, W. Bushnell..... 268,078
Fire kindler, J. H. French..... 268,215
Flour packer, J. B. Martin..... 268,253
Fodder press, J. Lynes 268,033
Folding seat for theaters and public halls, Underhill & Lake..... 268,154
Forceps, sheathed bladder, J. W. Merrill, Jr..... 268,089
Fork. See Culinary fork.
Fork for domestic and other uses, R. W. Turner.. 268,153
Frame. See Net frame.
Funnel holder, adjustable, J. R. & J. S. Johnson.. 268,239
Furnace. See Boiler furnace. Gas retort furnace. Glass furnace. Hydrocarbon furnace.
Furnace, J. G. McAuley..... 268,035
Furniture, attachment for folding and movable, J. W. Stanton..... 268,307
Gauge. See Axle gauge.
Game apparatus, B. B. Townsend..... 268,057
Gas meter, wet, W. Mackintosh..... 268,251
Gas regulator, G. S. Lacey..... 268,308
Gas retort furnace, H. C. Hann..... 268,096
Gate. See Tilting gate.
Gate, F. C. Wheeler 268,333
Gates, connecting rod for automatic, M. T. Reeves..... 268,282
Generator. See Electric generator.
Glass and mode of manufacturing the same, tube for blowing, J. B. Wilson..... 268,102
Glass furnace, H. Frank..... 268,213
Glass vase, urn, or other hollow glassware, and their manufacture, W. T. Murphy..... 268,266
Grain binder tension device, M. G. Hubbard..... 268,235
Grain binders, bundle divider for, W. H. Knapp.. 267,998
Grain drill, Elam & Boggs..... 268,361
Grain elevator, pneumatic, L. Smith..... 268,305
Grain elevator, pneumatic, L. L. Smith..... 268,305
Grate, fire, G. C. Maxwell..... 268,258
Gun stock, J. N. Squier..... 268,374
Gun swab, J. F. Davis..... 268,004
Halter, E. G. Latta..... 268,249
Handcuff, police, E. D. Bean..... 268,171
Handle. See Brush handle.
Hanger. See Door hanger.
Harness rosette, A. McManus..... 268,261
Harrow, A. O. Stiveson..... 268,312
Harrow, wheel, C. Murray..... 268,267
Harvester, Z. Fischesser..... 268,211
Harvester, grain binding, H. W. Case..... 268,357
Harvester rake, J. D. Tracy..... 268,151
Hat rack, W. C. Huss..... 268,023
Hatchway, self-closing, R. D. Thackston..... 268,146
Hay rack, J. J. Siebert..... 268,048
Hay rake, horse, T. C. Lord 268,109, 268,111
Head light, locomotive, J. Kirby, Jr..... 268,027
Heater. See Feed water heater.
High steam and low water detector, R. D. Barr... 268,353
Hoisting and conveying apparatus, Edwards & Kelly..... 268,208
Hoisting gear, W. W. Wythe..... 268,068
Holder. See Coin holder. Curtain rod holder. Dry plate holder. Funnel holder. Lamp holder. Lead or crayon holder. Opera glass holder. Sash holder. Sewing machine bodkin holder. Sewing machine thread card holder.
Horseshoe machine, A. Andersen 268,105
Horseshoe toe weight, F. A. Clark..... 268,189
Hose, multiple fabric, J. E. Gillespie..... 268,305
Hydrocarbon furnace, V. W. Blanchard..... 268,176
Ice creeper, R. Rommelsbacher..... 268,131
Ice machine, J. T. Davis..... 268,196
Indicator. See Speed indicator.
Insulating compounds, manufacture of, M. Mackay..... 268,094
Insulator, noise deadening, G. M. Brown..... 268,075
Jack. See Lasting and pegging jack. Lifting jack.
Journal bearing, R. W. & W. Hubbard..... 268,236
Journal shaft, H. E. Cunningham 268,194
Lamp chimney attachment, J. O. Illingworth..... 268,104
Lamp, electric arc, A Graham..... 268,218
Lamp, electric arc, Harling & Hartmann 268,224
Lamp, electric arc, J. McLaughlin 268,038
Lamp, electric arc, R. H. Mather..... 268,254
Lamp, electric arc, S. F. Van Choate..... 268,155
Lamp, electric incandescent, J. V. Nichols..268,269, 268,270
Lamp for railway cars and other vehicles, J. Schilke..... 268,134
Lamp, gas, R., J., & O. Pintsch..... 268,373
Lamp holder, incandescent, E. Weston..... 268,329
Lamp holder, incandescent electric, E. Weston... 268,330
Lamp, incandescing electric, T. A. Edison..... 268,206
Lamp, self-regulating, V. Di Marzo..... 268,114
Lantern, D. C. Baughman..... 267,993
Last, G. W. Osgood..... 268,271
Lasting and pegging jack, C. W. Hodgdon..... 268,019
Lathe cutter, C. V. Woerd 268,339
Lead or crayon holder, C. W. Boman 268,256
Leather cutting machine, J. N. Wake (r)..... 10,249
Lifting jack, T. J. Pearce..... 268,371
Lifting jack, H. A. Webber..... 268,326
Light. See Head light.
Lithographic stones, machine for grinding, P. C. Möller..... 268,119
Lock. See Nut lock. Padlock.
Locomotive, J. C. Higdon..... 268,231
Loom for weaving double-pile fabrics, Lister & Reinach..... 268,250
Loom for weaving pile fabrics, J. C. Duckworth.. 268,202
Loom harness, device for supporting, J. Sladdin.. 268,136
Lubricant, composition and burnishing, G. S. Boutwell..... 267,994
Lubricator, P. Barclay..... 268,169
Magneto-electric machine, O. Heikal 268,009
Measure cases, attachment for tape, J. Avery.... 268,168
Measuring vessel, G. J. Cave..... 268,186
Meat chopping machine, H. R. Shirk..... 268,298
Mechanical movement, R. W. Whitney..... 268,160
Metal rolls, shield for, H. McDonald..... 268,259
Metals with metal, apparatus for coating, H. Roberts..... 268,127
Meter. See Gas meter.
Milk, preparing substitutes for mothers', O. Lahrmann..... 268,245
Mill. See Feed mill. Windmill.
Mortising machine, endless chain, T. E. Daniels. 268,008
Mortising machine, endless chain, W. W. Green, Jr..... 268,014
Moulding cutters, instrument for ascertaining the draught of, G. M. Drummond..... 268,201
Musical box, E. Paillard 268,272, 268,273
Nail extractor, I. W. Woods..... 268,343
Net frame, mosquito, F. Reichert..... 268,283
Nut lock, J. R. Carter 268,079
Nuts and bolts, machine for making, McDonald & Carter 268,067
Oils, process of and apparatus for improving the fire test of, H. C. Smith..... 268,309
Opera chair, Harrison & Augerstein 268,225
Opera glass holder, W. Mack..... 268,112
Optometer, F. A. Hardy..... 268,016
Ore concentrator, S. M. Atchison..... 268,351
Ores, etc., concentrator and separator for, E. Warne..... 268,325
Oven for burning pulverulent fuel, M. Perret.... 268,277
Packing box, knockdown, N. B. Gordon..... 268,091
Padlock, D. Sweeney..... 268,142
Painting fence pickets, etc., by dipping, apparatus for, W. Thomas..... 268,148
Pan. See Vacuum pan.
Pen, metallic, B. Lawrence 268,249
Petroleum, device for burning, Bury & Bidelman. 268,077
Pipe. See Wooden pipe.
Piston, S. Armstrong..... 268,169
Planter check rower, corn, L. Eberhart..... 268,085
Planter check rower, corn, J. Harvey..... 268,097
Planter, corn, R. O. Robinson..... 268,293
Planter, band corn, O. T. Grattan..... 268,220
Planter, seed, H. Cole..... 268,191
Plow, A. Neely..... 268,268
Plow, J. H. Riggan..... 268,285
Plow, cultivator, M. Hancock..... 268,223
Plow, sulky, C. W. Post..... 268,280
Plowing apparatus, steam, N. W. Bradley..... 267,996
Polishing machine, G. F. Butterfield 268,180
Pot. See Coffee pot. Wire annealing pot.
Preservative for organic substances and process of making the same, W. F. Grier..... 268,094
Press. See Baling press. Broom corn press. Cigar packing press. Fodder press.
Printing machine, lithographic, R. Rathbone..... 268,043
Pulley block, T. R. Ferrell..... 268,364
Pulley block, W. Scholl..... 268,044
Pulley block, Ward & Howl..... 268,323
Pulverizing machine, F. W. Krause..... 268,039
Pump for refrigerating and ice machines, gas, Wood & Richmond..... 268,348
Pumps, exhaust steam condenser for steam, W. F. Holsing..... 268,100
Rack. See Hat rack. Hay rack.
Rake. See Harvester rake. Hay rake.
Reflector, W. Wheeler..... 268,064
Reflector for street lamps or lanterns, etc., W. Wheeler..... 268,063
Refrigerating and ice machine, Wood & Richmond 268,347
Refrigerating and ice machines, condense-water cooler for, Wood & Richmond 268,349
Regulator. See Gas regulator.
Rein, check, G. Theobald 268,147
Rein, driving, W. S. Sherd..... 268,046
Rocking chair, McCaffrey & Leonard 268,036
Roof or wall covering, D. McLean 268,260
Roofing, composition, M. Laflin 268,030
Rotary engine, J. T. Davis.....268,005, 268,195
Ruler, parallel, C. H. Wood 268,343
Saddle, gig, J. B. Gathright 268,008
Safe, F. H. Charter..... 268,187
Sash holder, W. A. Gay..... 268,217
Sash mechanism, window, W. Riley *et al* 268,286
Saw gummer and sharpener, J. H. & S. L. G. Bedingfield 268,070
Saw tooth, N. W. Spaulding..... 268,137
Scarf, neck, J. L. Strauss 268,053
Scraper, wheeled, Stubbs & Jonas..... 268,054
Screen. See Door or window screen. Window screen.
Seat. See Folding seat.
Seat, H. S. Hale 268,095
Secondary battery, A. K. Eaton..... 268,360
Secondary battery, E. T. & E. E. Starr..... 268,308
Seed and fertilizer distributer, G. R. Platt 268,279
Seed dropper, J. L. Williams..... 268,338
Sewing machine, J. R. Hebert..... 268,227
Sewing machine, L. E. Higby..... 268,230
Sewing machine, C. H. Palmer..... 268,122
Sewing machine, T. Tully..... 268,152
Sewing machine, Woodward & Fairbanks 268,346
Sewing machine attachments, clamping device for, R. S. Barnum 267,992
Sewing machine bodkin holder, G. Baum..... 268,170
Sewing machine buttonhole attachment, S. Cutler..... 268,002
Sewing machine shuttle, J. R. Hebert..... 268,229
Sewing machine take-up, F. Willhelm..... 268,161
Sewing machine thread card holder, G. Wicke.... 268,335
Sewing machine thread cutter and holder, H. C. Goodrich 268,012
Sewing machine tension device, J. R. Hebert..... 268,228
Sewing machine tuck maker, H. C. Goodrich 268,013
Sewing machines, loose flywheel for, J. R. Hebert..... 268,226
Sewing on buttons, machine for, J. Mathison..... 268,360
Shingle drawing and edging machine, W. L. Roberts 268,290
Shirt, knit, T. M. Grant..... 268,093
Shoddy and ragpickers, covering for the cylinders of, T. W. Harding..... 268,051
Shoes, machine for attaching buttons to, P. H. Sweet, Jr. 268,142
Slate, school, F. W. Mallett..... 268,252
Soap cake, A. Van Haagen..... 268,321
Sofa, lounge, seat, etc., H. Roberts..... 268,280
Soldering machine, can, J. S. Hull..... 268,022
Specific gravity apparatus, T. Sourbé..... 268,049
Speed indicator, W. Lang..... 268,107
Speed indicator and register, D. Young..... 268,350
Spool, I. C. Davis..... 268,197
Spool of thread, I. C. Davis..... 268,198
Spring. See Carriage spring. Vehicle spring. Wagon seat spring.
Springs, apparatus for making, Woodruff & Barson 268,184
Stair rod securer, M. L. Woodward..... 268,165
Stamp battery, ore, J. M. McFarland..... 268,115
Stamping machine and die, E. Norton..... 268,041
Steam trap, G. W. Coffee..... 268,051
Steam wheel, S. J. Webb..... 268,327
Steel blooms and billets, manufacture of, W. Hainsworth..... 268,222
Stencils, perforating instrument for producing, D. Gestetner 268,009
Stirrer, pot, A. Caufman..... 268,185
Stirrup hood, A. Ayers..... 268,352
Stool, folding, B. Frasco..... 268,214
Stove, Willi & Linxweiler..... 268,066
Stove and burner and heating drum, gas, E. Detwiler 268,069
Stove for burning straw, hay, and cornstalks, N. Compton 268,193
Stovepipe shelf, J. M. Black..... 268,072
Stovepipe shelf, Kurtis & Bray..... 268,244
Straw cutter, W. M. Fitzwater..... 268,212
Sugar, salt, etc., apparatus for the manufacture of, F. P. Taber..... 268,056
Tape line case, G. Clark..... 268,190
Tapestry, needle woven, M. E. Tillinghast..... 268,149
Telegraph, printing, A. F. & F. B. Johnson..... 268,237
Telegraphic circuits, condenser for, B. Thompson, 268,317
Telephone exchange system and apparatus, J. H. Rogers. 268,294
Telephone toll apparatus, J. W. See..... 268,045
Telephonic apparatus, W. J. Dudley..... 268,350
Thrashing machine band cutter and feeder, M. R. Perring..... 268,272
Tilting gate, automatic, W. S. Castor..... 268,080
Toaster, reversible, R. Sherman..... 268,047
Tobacco, process of and apparatus for moistening leaf, G. Robinson..... 268,291
Tobacco steaming box, W. Nohr..... 268,121
Tool stock, J. D. Richardson..... 268,284
Top, automatic, L. Townsend..... 268,318
Trace carrier, D. Freer..... 268,089
Traction engine wheel, J. Walrath..... 268,058
Transom hanging device, J. Kirby, Jr..... 268,267
Trap. See Steam trap.
Treadle, F. H. Burrows..... 267,906
Tube bending machine, S. Stephens..... 268,050
Twine polishing and finishing machine, R. A. Kelly..... 268,242
Urinal, R. E. Day..... 268,009
Vacuum pan, E. Riese..... 268,126
Valve, balanced slide, J. E. Sweet..... 268,055
Valve, balanced slide, W. B. Turman..... 268,319
Valve, safety, G. E. Collier..... 268,093
Varnish, water lac, G. H. Beck..... 268,172
Vehicle perch heel, G. M. Peters..... 268,123
Vehicle spring, N. B. Cooper..... 268,193
Vehicle, two-wheeled, W. C. Evants..... 268,087
Vehicle wheel, Wolff & Miltimore 268,341
Ventilator, P. Casnar..... 268,183
Vessels, compound for lining, E. G. Frisbie..... 268,216
Wagon seat spring, M. H. Cassiday..... 268,182
Washboard and clothes pounder, combined, H. Lake..... 268,248
Washing machine, clothes, Hilpert & Biggerstaff.. 268,232
Washing out or separating soluble from insoluble substances, apparatus for, H. Schaede..... 268,133
Watch plate, dust proof, A. Bitner..... 268,354
Watches, machine for roughing out pinions, arbors, and staffs for, C. V. Woerd..... 268,340
Water closet, F. W. Kelly..... 268,026
Water cooler and filter, S. L. McBride..... 268,257
Water elevator, A. J. English..... 268,088
Water in buildings, apparatus for turning off, J. D. Westgate..... 268,062
Water wheel, turbine, Risdon & Tyler..... 268,287
Weigher and tally, grain, J. Beeler..... 268,173
Wheel. See Fifth wheel. Steam wheel. Traction engine wheel. Vehicle wheel. Water wheel.
Windmill, J. S. Meyer..... 268,262
Windmill, R. O. Robinson..... 268,292
Window cleaning chair, F. Sandvos 268,132
Window screen, G. L. Reynolds..... 268,125
Wire annealing pot, H. Roberts..... 268,128
Wire feeding apparatus, H. Roberts..... 268,288
Wire pickling apparatus, H. Roberts..... 268,130
Wire wiping apparatus, H. Roberts..... 268,129
Wooden pipe, Johnson & Williams..... 268,024
Wrench, L. Wood 268,344

DESIGNS.

Bridle bit, A. Buermann 13,458
Bridle bit pattern, A. Buermann..... 13,459
Card, show, M. H. Wiener..... 13,463
Carpet, E. Fajon..... 13,460
Carpet, Hunt & Rollings..... 13,461
Carrycomb, H. C. Brill 13,457
Lamp and reflector, combined street, S. F. Van Choate..... 13,462
Stove, Bascom & Heister..... 13,454
Stove, cook, Bascom & Heister 13,455
Stove or range, Bascom & Heister..... 13,456

TRADE MARKS.

Cigars, cigarettes, and smoking and chewing tobacco, H. M. Mason..... 9,840
Pencils, lead, E. Faber..... 9,848
Soap, laundry, Procter & Gamble. 9,841, 9,842, 9,843, 9,844, 9,849
Stationery, certain articles of, E. Faber 9,847
Toilet preparation, A. Weeden. 9,846
Toilet wash for the complexion, F. A. Jones..... 9,899
Watch cases and movements, Vacheron & Constantin..... 9,845

English Patents Issued to Americans.

From October 31 to November 3, 1882, inclusive.

Bathing apparatus, W. W. Rosenfield, New York city.
Boat lowering apparatus, M. Rourke, Youngstown, O.
Cable traction railway, C. F. Findlay, Chicago, Ill.
Compound for preventing the passage of heat, R. J. Elbert *et al.*, New York city.
Door check, The Elliott Pneumatic Door Check Company, Boston, Mass.
Door fastening, J. W. Kropps, New York city.
Electric time ball apparatus, Standard Time Ball Company, New Haven, Conn.
Flax breaker, J. Shinn, Philadelphia, Pa.
Gas stove, W. W. Goodwin, Philadelphia, Pa.
Machinery, apparatus for starting, J. A. Horton, Reading, Pa.
Motor, W. S. Colwell, Pittsburg, Pa.
Printing machine, Cornell & Shelton, Birmingham, Conn.
Reaping machine, W. A. Wood Mowing and Reaping Machine Company, Hoosick Falls, N. Y.
Stone crusher, S. L. Marsden, New Haven, Conn.
Stovepipe attachment, C. Lovell, Massachusetts.
Table, F. F. Atkinson, New York city.
Telegraph printing apparatus, A. A. Knudson, Brooklyn, N. Y.
Time detecter, G. F. Ransom, Cleveland, O.
Water closet, J. Cooper, Boston, Mass.
Weighing and package filling apparatus, C. C. Clawson, Raleigh, N. C.
Umbrella spring, W. H. Belknap, New York city.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. H. D. asks how the polish on bright wire screw eye hooks is put on, and what is used to prevent their rusting readily (they appear to be rust resisting); at what part of the process of manufacture is it done? A. Screw eye hooks receive their bright polish before the thread is cut, by tumbling in sand, gravel, or any mixture that will produce a clean surface. They are then threaded, and receive a final tumbling with leather skivings and any cheap polishing powder with an admixture of lime. Some boil them in lime water, and use sawdust for finishing.

(2) G. M. asks: 1. What book would you advise me to get concerning steam engines and how to make them, for amateur? A. "Goodeve on the Steam Engine" and "Roper on Land and Marine Engines." 2. Is working a lathe in a machine shop a good branch of mechanics? A. It is only a part of a machinist's trade, and should be learned as such. 3. How long does it generally take a person to learn lathe work? A. It depends much upon the person; some two years, others five years, and others never can learn so as to become ready and quick workmen.

(3) R. S. T. writes: I have just been reading an article in your last issue entitled "How a Fire sweeps a Wooden House." Thinking it would do no harm, even if it does no good, I will tell you how I fixed a house as a protection against mice, and I think it must be of service in case of fire, although that was not thought of at the time. After the house was up and closed in and the under floors laid, I took any pieces of waste boards, cut them to the right length and width to fit the spaces between studding, and nailed them in flush with the bottom of the ledger board between that and the outside boarding, and by so doing I had a box between each pair of studs that would hold about six or eight quarts, which I filled with cheap mortar made by using a very little lime and the coarse sand and gravel that the masons could not use in their mortar. I also let the under floors run to the outside boarding, and spread the mortar on them about one inch deep between the base boards and outside boarding in each story. This was done only to stop rats and mice, and was a perfect success.

(4) H. K. asks (1) how many cubic feet of air it takes to burn a cord of soft wood per hour. A. In practice, 70 to 80 cubic feet per 1 pound of wood. Theoretically, only about half this quantity. 2. Also what per cent of heat is put into steam where ordinary return flue boilers are used? In other words, what part of the heat goes up the smoke stack? A. This cannot be determined, and it depends much on the setting and proportions of the boiler and the temperature maintained in the furnace. The temperature of the gases in chimney usually varies from 400° to 600° Fahr. 3. How many cubic feet of air will a three pound pressure force through an eight inch pipe a hundred and fifty feet long? A. About 62 feet per second, depending upon the character of the pipe and number and shortness of bends.

(5) J. R. W. writes: In your November 4 number of the SCIENTIFIC AMERICAN, on page 290, question No. 4 is asked by E. B., and answered, as to a simple test for detecting sewer gas in a room or apartment. I wish to know whether the same method or some other will determine the existence of coal gas in distinction from other gases, when they cannot be determined by the odor? A. The test there noted is for sulphureted hydrogen, and would also show coal gas, or any gas containing sulphureted hydrogen.

(6) E. H. asks how much water is used to the pound of lime in preparing lime water. A. Twenty gallons.

(7) E. N. P. asks: Will you give me formula for calculating the horse power when the fall of water is 16 feet, and volume or flow 450 cubic feet per second? I find a rule thus, but I don't exactly understand it: "To the actual head or depth of fall, add the height due to the velocity of the water in the head race. Multiply the sum by the volume of the flow of water per second, and by the gross power in foot pounds (62·4) per second; this divided by 550 gives the gross horse power." Please give me explanation of what constitues "the height due to the velocity." A. "The height due to the velocity" is the additional power given by the velocity of the current, and is obtained by dividing the square of the velocity of the current in feet per second by twice the distance that a body falls in one second. This quotient multiplied by the constant one and one-tenth (1·1) gives the height due to the velocity of the water in the head race; the velocity being the cubic feet of flow divided by the area of the sluice in square feet. The formula as given is $\frac{V^2}{2g} \times 1{\cdot}1$, where V = velocity; 2g = 64 333 = twice the height a body falls in one second. The rest of your rule is correct.

(8) H. N. asks: 1. What is the proper size of smoke stack for a horizontal boiler 3 feet 6 inches by 9 feet, forty 2½ inch tubes? A. At least 20 inches diameter. Your draught cannot be strong, as it will be cramped in the tubes. 2. The distance the brick wall should be from rear end of boiler? Is there a rule for either or both of the above questions? A. 18 inches; there is no rule. 18 inches is more than necessary for draught, but there should be room for a man to work.

(9) P. R. C. asks: What acid is commonly used for cleaning mortar, etc., from brick work before pencilling, and should it be used full strength? A. Use diluted muriatic acid, one part of acid to three of water.

(10) G. A. H. writes: 1. I have some samples of pig iron which I wish to coat with some anti-rust preparation that will not deaden the luster or rub off when the samples are handled. Can you tell me of such a preparation? A. Try a solution of gum arabic or a thin mastic varnish. 2. A friend has a very old and choice piece of Japanese carved landscape in ivory, which has grown yellow. Is there any way to cleanse the same and whiten the ivory without injury to the delicacy of the carving? A. Benzine carefully used will answer.

(11) J. W asks: How far can the best known fire engine throw water horizontally, when it has to pump the water out of a reservoir? A. 210 to 215 feet; it is claimed that 240 to 250 feet has been accomplished on test trials.

(12) A. C. asks if there is more strain on one part of the main rod of a locomotive than another. If so, what part, and why? A. No; not from the direct action of the steam, but there may be lateral strains more at one point than another.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. H.—It is a very impure but finely divided kaolin or china clay, and could be used for making pottery or in the present condition as a soft polishing compound. —S. L. M.—It is carbonate of lime colored with sesquioxide of iron.

COMMUNICATIONS RECEIVED.

On Electric Storms. By J. A.
On the Aurora Borealis. By E. E. M.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

COLLEGE OF ST FRANCIS XAVIER, 30 TO 40 W. 15TH ST., NEW YORK, Nov. 1, 1882.
To H. W. Johns Manufacturing Company.
GENTLEMEN: Your Asbestos Coverings are in use in our church and college, and give us great satisfaction.
Yours truly. S. H. FRISBEE, S. J., Rector.

ST. FRANCIS XAVIER COLLEGE, 30 W. 15TH ST., NEW YORK, Nov. 15, 1882.
H. W. Johns M'f'g Co., 87 Maiden Lane, New York.
GENTLEMEN: Before using your air chamber coverings on our pipes we were losing, actual test by steam gauges, eight (8) pounds pressure between boiler and trap or receiver: now the loss is so slight that we can scarcely distinguish it. Our saving of coal by its use is at least thirty (30) per cent.
BROTHER MCCLOSKEY, Engineer.

For a bad cold every good housekeeper has a cure, but for a bad pen the remedy is to get one of Esterbrook's.

Engines, 10 to 50 horse power, complete, with governor, $150 to $250. Satisfaction guaranteed. More than seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Brass Finishers' Turret Lathes, 13½ x 4, $165. Lodge, Barker & Co., 159 Pearl St., Cincinnati, O.

Inventors' wants supplied. Models, patterns, experimental work. Morse's Novelty Works, 43 Duane St., N.Y.

Parties having New or Second-hand Tripod Rock Drills to sell cheap, address V. Castner, Changewater, N. J.

Important to Inventors.—The Anglo-American Patent Development Company, Limited, 28 Southampton Buildings, London, England, Authorized Capital $250 000, is prepared to receive applications from American Inventors to develop (by manufacturing or otherwise) their inventions in Europe. Full particulars addressed as above by Registered Letter to be forwarded, with $5.00 U. S. Currency, to cover expense of investigation, otherwise applications cannot be considered. Inclose stamp for Prospectus of Company to Messrs. Knauth, Nachod & Kuhne, Bankers, New York.

Manufacturers of hydraulic or steam presses for extracting oil of castor beans, cotton seed, or tallow may find it to their advantage to send illustrated catalogues and price lists, with export discounts to W. C., P. O. Box 3,184, New York.

Thomas Camp, of Covington, Georgia, General Agent for the sale of Portable Steam Engines, has a trade of $250,000 per annum in that State. Manufacturers will find this the best medium in the South through which to sell such goods. None but first-class engines sold. Best of reference given and required.

Curtis Regulator. Float, and Expansion Trap. See p.364.

A Portable Electric Lighter for $5 00 is being extensively sold by the Portable Electric Light Co., of 79 Water Street, Boston. It is an economical and safe apparatus for lighting for home and business purposes. Their illustrated circular is sent free.

Woodworking M'ch'y. Bentel, Margedant & Co., p.382.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Machine Diamonds. J. Dickinson, 64 Nassau St., N.Y.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 382.

Walrus Leather. An extra fine lot of heavy trimmed walrus for polishing metals. Greene, Tweed & Co., N. Y.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 382.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p.382.

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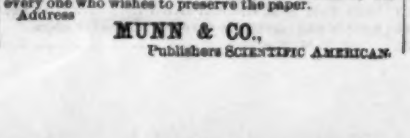

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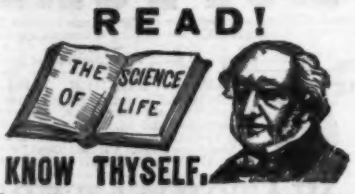

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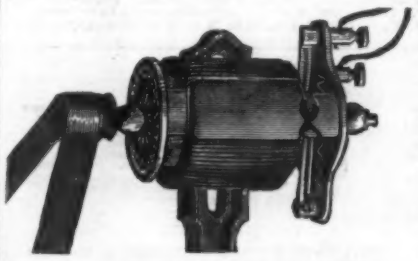

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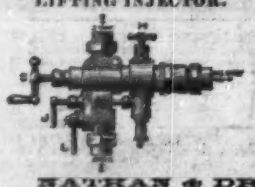

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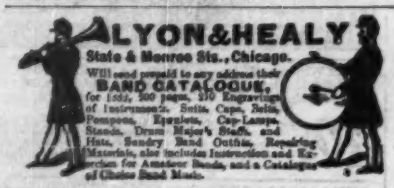

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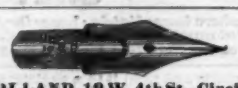

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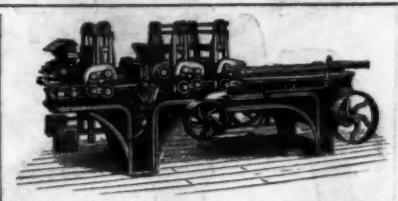

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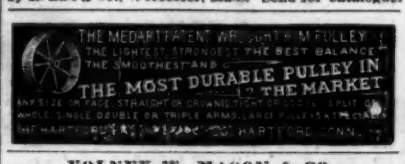
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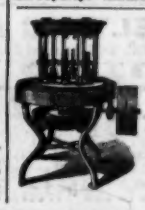

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